

Raptors in northern Cameroon, December 2005–December 2010

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Rapaces au Cameroun du nord, décembre 2005–décembre 2010. Les rapaces des principaux habitats du Cameroun du nord ont été recensés entre décembre 2005 et décembre 2010. Une analyse est présentée de 60 espèces de rapaces. Parmi celles-ci, six espèces n'avaient pas été documentées au nord du Cameroun avant 2005. Des informations sont présentées sur plusieurs espèces afrotropicales régionalement rares ou peu étudiées telles que le Messenger sagittaire *Sagittarius serpentarius*, le Baza coucou *Aviceda cuculoides*, le Circaète de Beaudouin *Circaetus beaudouini*, l'Aigle d'Ayres *Hieraaetus ayresii*, l'Épervier de Hartlaub *Accipiter erythropus*, l'Épervier de l'Ovambo *A. ovampensis* et le Faucon de Cuvier *Falco cuvierii*. Des données sont également fournies sur le comportement, le cycle de reproduction, la mue, le succès de reproduction, l'alimentation, les modalités et le succès de chasse, la migration saisonnière, et la dispersion de nombreuses espèces, ainsi que des observations de 12 migrateurs paléarctiques peu observés. L'Aigle des steppes *Aquila nipalensis*, l'Aigle impérial *A. heliaca*, la Buse féroce *Buteo rufinus* et le Faucon de Barbarie *Falco (peregrinus) peregrinoides* semblent être plus courants dans la zone d'inondation de la région de l'Extrême-Nord que précédemment rapporté. En conclusion les menaces qui pèsent sur cette riche communauté de rapaces sont examinées.

Summary. We conducted raptor surveys in all major habitats of northern Cameroon between December 2005 and December 2010. Details for 60 raptor species are presented. Of these, six had not been documented in northern Cameroon prior to our survey. Information is presented on regionally rare or little-studied Afrotropical raptors such as Secretary-bird *Sagittarius serpentarius*, African Cuckoo Hawk *Aviceda cuculoides*, Beaudouin's Snake Eagle *Circaetus beaudouini*, Ayres's Eagle *Hieraaetus ayresii*, Red-thighed Sparrowhawk *Accipiter erythropus*, Ovambo Sparrowhawk *A. ovampensis* and African Hobby *Falco cuvierii*. Details are given on the behaviour, breeding cycle, moult, reproductive success, diet, foraging, prey capture success, seasonal migration and dispersal of many species. Records further include details for 12 infrequently observed Palearctic migrants; Steppe Eagle *Aquila nipalensis*, Eastern Imperial Eagle *A. heliaca*, Long-legged Buzzard *Buteo rufinus* and Barbary Falcon *Falco (peregrinus) peregrinoides* appear to be commoner visitors to the inundation zone in the Far North Region than previously reported. We conclude with a discussion of threats to this rich raptor community.

Information on raptor abundance, movements and breeding in many western African countries is scarce (but see Thiollay 1977, 1989 and references therein), although repeated country-wide surveys between the late 1960s and 2003–04 show that many raptors have significantly declined over vast areas (Thiollay 2006). Northern Cameroon has been relatively well visited by ornithologists compared to some other countries in the region (see Louette 1981, Dowsett *et al.* 2013). The avifauna of the Waza-Logone floodplains in particular has been relatively well documented (Fry 1970, Mundy 1972, Robertson 1992, Sørensen *et al.* 1996, Scholte *et al.* 1999), including surveys that focused specifically on raptors (Thiollay 1978a, 2001, Scholte 1998). However, few recent publications cover the savanna region south of the Waza-Logone area, most providing merely

isolated records of new or rare species based on short visits (e.g. Girard & Thal 1996, Dowsett & Dowsett-Lemaire 2000, Languy *et al.* 2005), including raptors (Mills *et al.* 2003). The lack of knowledge is especially pronounced for the vast Bénoué Valley, one of the few large conservation complexes in western Africa and potentially of great importance to disturbance-sensitive large raptors. To fill some of this knowledge gap, we present information on the raptor community of northern Cameroon, collected between December 2005 and December 2010.

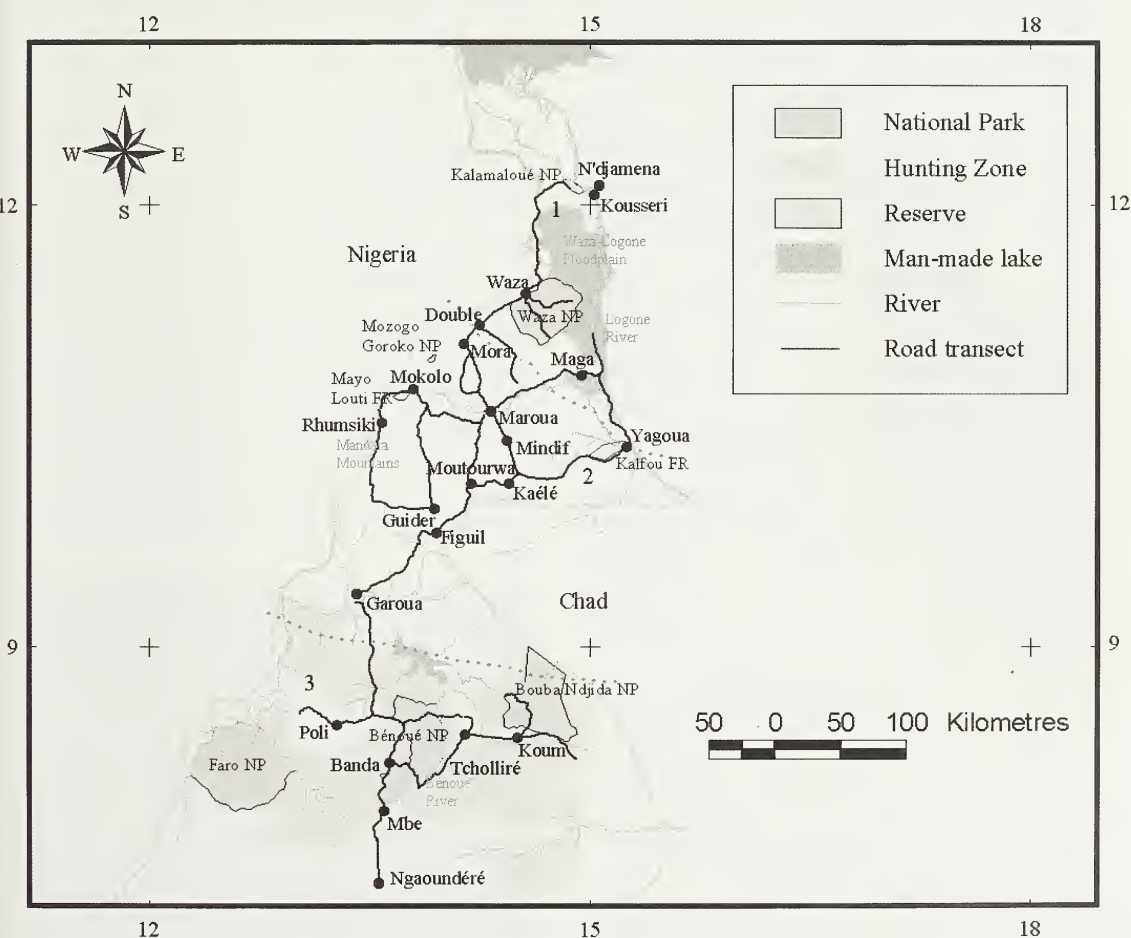
Study area and Methods

Surveys were mostly conducted in the Far North and North Regions of Cameroon, but extended into the Adamawa Region (Fig. 1). Rains occur between April into October, peaking in June–



Figure 1. Study area in northern Cameroon, and map with location of road transects. Dotted lines indicate the boundaries of the inundation zone (1), the Sudan zone (2) and the Bénoué Valley (3).

Zone d'étude au Cameroun du nord et carte indiquant les routes des transects. Les lignes en pointillés indiquent les limites de la zone d'inondation (1), la zone soudanienne (2) et la vallée de la Bénoué (3).



September in the north and in May–October in the south. Mean annual temperatures vary from 24°C in the south to 28°C in the north, and peak in March–May, when they reach 47°C in the inundation zone.

Road surveys covered three biogeographical zones, which are representative of three main savanna types between the 450–1,600 isohyets in western Africa (White 1983) differing in productivity and vegetation composition. The

inundation zone in the Far North Region encompasses the 8,000-km² Waza-Logone floodplains fringed by dry woodlands on higher ground. It is dominated by a Sahelian climate, and located at the transition of the Sahel and Sudan climatic zones (rainfall: 450–700 mm / year), in the southern Lake Chad Basin. Habitat is dominated by the partially flooded grasslands of the Waza-Logone area, with communities of *Acacia* and broad-leaved trees (White 1983), notably *Sclerocarya birrea* woodland with *Anogeissus leiocarpus*, *Balanites aegyptiaca* and *Acacia seyal*. Agriculture is mainly dry-season sorghum, millet and rice. The 1,700-km² Waza National Park (NP) and 45-km² Kalamaloué NP protect part of the floodplains, but poaching is a serious threat to wildlife (Scholte 2003, Tumenta *et al.* 2010).

The Sudan savanna zone to the south (rainfall: 700–1,100 mm / year) is characterised by hilly terrain that rises to the Mandara Mountains in the west (500–1,000 m in the highest parts), with undifferentiated Sudanian woodlands ('North Sudanian zone': White 1983). Heavily exploited forest reserves and Mozogo-Gokoro NP support trees such as *Isobrerlinia doka*, *Balanites aegyptiaca*, *Piliostigma reticulatum* and *Combretum erythrophyllum*. Local people grow sorghum, millet, maize, beans, cotton and groundnut.

The Bénoué Valley is situated in the area of highest rainfall (1,100–1,600 mm / year). It lies on undulating terrain with some scattered rocky outcrops, south to Ngaoundéré on the Adamawa Plateau ('South Sudanian zone': White 1983), and has often been referred to as the Northern Guinea savanna belt (e.g. Thiollay 1989). The Bénoué Valley encompasses a large river system and three national parks (Bénoué, Bouba Ndjida and Faro) covering c.7,600 km² with *Isobrerlinia doka*-dominated wooded savanna and *Anogeissus leiocarpus*-dominated riparian forests along watercourses. Twenty-eight sport-hunting zones cover an additional 16,000 km² and are managed as protected areas, with hunting quotas for larger mammals and gamebirds (Mayaka 2002). Cultivation consists of traditional crops such as millet, but increasingly cotton.

Most survey time was in the form of road transects (*cf.* Buij *et al.* 2013b for details), as well as point counts (e.g. for harriers; see Buij *et al.* 2012 for details), from December 2005 to December 2010, and while studying land-

use effects on raptors as part of a Ph.D. study conducted in northern Cameroon from March 2007 (*cf.* Buij 2013 for details). Surveys covered all major habitat types, including cultivated land, national parks (Waza, Kalamaloué, Mozogo-Gokoro, Bénoué, Faro and Bouba Ndjida), hunting zones (Bénoué Valley) and forest reserves (FR; Kalfou and Mayo Louti). To determine the relative abundance of raptors in the dry and wet seasons, eight road transects each of 35–115 km were surveyed in each zone, totalling 425 km in the inundation zone, 897 km in the Sudan zone and 603 km in the Bénoué Valley (*cf.* Buij *et al.* 2013b). These were surveyed eight times, once every six-month period between March 2007 and December 2010, by both authors, from a slow-moving vehicle. We repeated surveys four times in the dry (15 October–15 April) and four times in the wet seasons (15 April–15 October). In the Bénoué Valley, 90 km of transect (the area east of Tcholliré) was inaccessible in the wet season and therefore was surveyed only during the dry season. Repeat transects were initiated from opposite directions to reduce time bias in raptor detectability in response to increasing air temperatures. Apart from repeated transects, an additional 675 km of road surveys were driven in the inundation zone during the dry season (October–December, February–March) and 327 km during the wet season (April–May, August–September); and in the Sudan zone, 1,040 km during the dry season (October–December, March–April) and 110 km during the wet season (July). These counts were used to examine monthly variations in abundance at different latitudes (i.e. not average dry- and wet-season estimates). Road transects started at 06.30–07.30 hrs and ended before 12.30–13.30 hrs.

Transect counts provided an index of relative abundance ($N / 100$ km), which was averaged for the entire survey period, separately for dry and wet seasons, or provided as monthly values for separate transects. Road counts were augmented by opportunistic observations, one-hour point counts (in 2006 and 2009–10), whereby all raptors in view were recorded, and stationary counts during other field studies, in the Waza-Logone area and Bénoué Valley. These covered all months, but some areas were more extensively covered during the dry than the wet season, notably the floodplains west of the Logone River and the eastern Bénoué Valley.

Birds were identified based on available literature (e.g. Forsman 1999, Ferguson-Lees & Christie 2001) and various species-specific publications (e.g. Shirihihi & Forsman 1991, Forsman 1995, 1998, Clark 1996, 2004, Clark & Schmitt 1998). Plumage descriptions follow Clark (2004), e.g. juvenile is that plumage retained until first annual moult.

Results and Discussion

We recorded 60 raptor species, as follows. Species of conservation concern (IUCN 2013) are indicated by EN = Endangered, VU = Vulnerable and NT = Near Threatened. Sequence and taxonomy follow Dickinson & Remsen (2013).

Secretary-bird *Sagittarius serpentarius* VU

Sedentary. Mostly seen in woodland within Waza NP (often drinking at waterholes in February–May), but also on the floodplain, and near the Logone River 60 km south of Maga (one, 2 June 2007). Singles or 1–2 pairs noted annually in Waza NP, in all months except September. One pair often foraged on burnt grasslands in the western section of Waza NP in November–December 2007, 2008 and 2010. A pair with a dependent juvenile in Waza NP in February 2007 were possibly indicative of (nearby) breeding (Fig. 2). One in Waza NP in February 1973 (Thiollay 1978a, who attributed the species' rarity there to seasonal flooding), and one in the hills south



Figure 2. Adult and juvenile Secretary-bird *Sagittarius serpentarius*, Waza National Park, Cameroon, 22 February 2007 (Ralph Buij)

Messagers sagittaires *Sagittarius serpentarius* adulte et juvénile, Parc National de Waza, Cameroun, 22 février 2007 (Ralph Buij)

of Mora in 1971 (Holmes 1972), but regular observations in Waza and Kalamaloué NPs in the 1990s (Scholte *et al.* 1999). Rare south of the inundation zone, with two records in Bouba Ndjida NP, both in April (2007/2010), possibly indicative of southward movement during the dry season (Thiollay 1978b). A specimen from Boki (van den Elzen 1975). Has strongly declined throughout West Africa and is on the brink of regional extinction (Hofmeyr *et al.* in prep.).

Osprey *Pandion haliaetus*

Palaearctic migrant. Twenty-one recorded, mostly observed hunting over the Logone River, Lake Maga or canals of the Maga rice scheme, in October–April, but occurs throughout the study area south to Poli. A juvenile often roosted on a pruned *Acacia* near Maga town in October–November 2007. Max. on or near Lake Maga just three; in comparison, seven reported near Maga on 16 January 1993 (Scholte *et al.* 1999) and five during a census on and around the lake in January–February 2000 (Thiollay 2001). Further, along 23 km of the Logone River, between Pousse and Tikélé, 0.13 birds / km were recorded in January 2001 (Zwarts *et al.* 2009); mean abundance along the same stretch of river was 0.03 birds / km in 2005–10 (six counts in October–May; range: 0–0.10 birds / km). Along another 45–66 km of the Logone River and adjoining floodplains between Pousse and Yagoua, mean abundance was 0.02 birds / km (seven counts in November–May; range 0–0.07 birds / km). These data suggest a decline; Osprey may be vulnerable to shooting, trapping, contamination of surface water and reduced fish stocks in Sahelian floodplains, including the Lake Chad Basin (Zwarts *et al.* 2009). Earliest date: 27 October 2007, near Maga; latest: 29 May 2008, over the Logone near Yagoua. None recorded during the boreal summer, but one on 29 August 1994 in the Waza-Logone region had presumably over-summered (Scholte *et al.* 1999), and ringing recoveries from West Africa reveal that small numbers do so (EURING database).

Black-winged Kite *Elanus caeruleus*

Recorded year-round in most areas, but local movements in the Far North Region. This rodent specialist increased threefold in northern Cameroon between 1973 and 2000 (Thiollay

2001) and appears to be one of the few species that has benefitted from deforestation and expanding cultivation. Common throughout the north, particularly in the inundation zone (mean density 7.9 birds / 100 km), but scarce in continuous woodlands of the Bénoué Valley and absent from parts of the floodplain during the inundation: abundance peaks in February–March (10.9 birds / 100 km), but gradually declines from the early rains (May–June: 6.8 birds / 100 km) to October (1.2 birds / 100 km), following which an influx occurs in November–December (7.6 birds / 100 km). This suggests exodus from the inundation zone during the rains, when high grass cover and flooding depress prey availability. Thiollay (1977) noted a four to eightfold increase in abundance in the Sahel in July–November, so such movements may be northwards. However, the species is observed year-round in other areas, such as rice fields and cultivated areas in the Sudan zone (dry season: 3.2 birds / 100 km; wet: 2.4 birds / 100 km) and the Bénoué Valley (dry season: 2.9 birds / 100 km; wet: 4.6 birds / 100 km). Courtship and mating in the Far North Region observed in December–January, and pairs at nests in January–April. Five nests were in *Faidherbia albida* trees among sorghum (2) and rice fields (3, but up to five breeding pairs) in the inundation zone.

African Swallow-tailed Kite *Chelictinia riocourii*
Intra-African migrant. Common in dry wooded grasslands of the inundation zone, especially in December–June (abundance: 28.3 birds / 100 km), after which moves north into the Sahel; few linger to late July, none seen mid August–October, when present in small numbers further north (Gustafsson *et al.* 2003). Unlike in Nigeria, where this species is nowhere common and regular (mainly February in the Far North Region, also June–July: Elgood *et al.* 1973), it occurs regularly at the Waza-Logone floodplain, where it breeds singly or in colonies of 2–13 nests in woodlands and around cultivated fields and settlements, in April–July (mean 0.6 nests / km²; Buij *et al.* 2013a). Much less numerous in the Sudan zone, where 2.55 birds / 100 km in the dry and 1.06 birds / 100 km in the wet season. Two adults south of Garoua on 9 March 2008 (09°10'N 13°49'E) and 23 December 2008 (08°98'N 13°53'E). A single group of 211 individuals flying high over the centre of Waza NP in



Figure 3. Juvenile African Swallow-tailed Kite *Chelictinia riocourii* swallowing a skink (Scincidae sp.), near Mora, Cameroon, 31 March 2007 (Ralph Buij)

Élanion naucier *Chelictinia riocourii* juvénile avalant un lézard (Scincidae sp.), près de Mora, Cameroun, 31 mars 2007 (Ralph Buij)

the morning of 13 January 2009 was perhaps indicative of a nearby roost (*cf.* Buij *et al.* 2013a), and comparable in size to a group of 200 in April 1966 in Waza NP (De Greling 1972). Reptiles important in diet during breeding season (Buij *et al.* 2013a), but in non-breeding season takes mostly grasshoppers, and few reptiles (Fig. 3). No significant decline reported in northern Cameroon between 1973 and 2000 (Thiollay 2001), contrary to the situation outside protected areas in central West Africa (Thiollay 2006). Appears to adapt to modified habitats but may be impacted by loss of tree cover; nesting success in northern Cameroon rather low at 17% (Buij *et al.* 2013a).

European Honey Buzzard *Pernis apivorus*

Paleartic migrant. Observed between 1 September and 16 June (17 in the Far North Region and 14 in North Region). Eighteen (58%) were seen 22 April–16 May, including six adults (five males, one female) circling north at low altitude in Waza NP on 5 May 2010 and an adult female perched and later flying through riverine woodland at Bénoué NP on 22 April 2006 (Fig. 4). Eleven (35%) were recorded 1 September–1 December. Most were flying high or rapidly gaining height, which together with the boreal spring and autumn peaks in records indicate that Cameroon's savannas are mostly crossed en route to the main wintering range in the forest zone (*cf.* Thiollay 1977). This is supported by observations of satellite-tracked birds from Sweden, which reached their West African wintering grounds at a mean latitude



Figure 4. Adult female European Honey Buzzard *Pernis apivorus*, Bénoué National Park, Cameroon, 22 April 2006 (Ralph Buij)

Bondrée apivore *Pernis apivorus*, femelle adulte, Parc National de la Bénoué, Cameroun, 22 avril 2006 (Ralph Buij)

of 06°24'N in September–November (Hake *et al.* 2003), although immatures may remain at relatively northerly latitudes, between 09°54'N and 13°35'N, before moving further south in November (Strandberg *et al.* 2012). All previous records in the Waza-Logone area were in the boreal autumn: three in October, two in November (Scholte *et al.* 1999) and five on 10–11 September 1975 (Thiollay 1978a); two were seen in the Lake Chad region of Nigeria on 14 September 2000 (Gustafsson *et al.* 2003).

African Cuckoo Hawk *Aviceda cuculoides*

Sedentary, but local movements cannot be excluded (*cf.* Elgood *et al.* 1973). Recorded year-round but most frequently during the rains, when pairs are presumably breeding and therefore more conspicuous (Brown 1970). Uncommon in the Bénoué Valley (15 birds; December, April–September) in woodland, riverine forest and at woodland edge, also over cultivation. Twice an adult pair was observed hunting; in both cases the birds perched 5–100 m from each other 3–6 m above ground while scanning the surrounding trees and ground for prey. A pair performed an undulating display flight (no calls heard) on 27 July 2009, c.5 km south of Banda. A pair circling over Kalfou FR on 25 July 2008 and an adult there on 3 October 2008. A juvenile circling in Waza NP on 2 July 2010 is the northernmost record for Cameroon; a second-year was seen perched in *Eucalyptus* near Maga on 8 December 2007. Other records of single adults in flight

in May and July, near Maroua and Rhumsiki. These are the first published records north of Ngaoundaba (07°08'N) and suggest that the species has previously been overlooked in northern Cameroon.

African Harrier Hawk *Polyboroides typus*

Throughout the north in small numbers, but commonest in the Bénoué Valley (mean 1.0 bird / 100 km). No evidence of seasonal movements northwards with the rains (*cf.* Thiollay 1978b) and the only record north of Waza was in August. Observed predating weaver (*Ploceidae* spp.) nestlings in trees along the Bénoué River, African Swallow-tailed Kite nestlings in the Far North Region (Buij *et al.* 2013a) and two adults were observed probing cavities in Waza Rock (probably for bats, possibly lizards). Individuals of all ages at waterholes in Waza NP in March–April. Two adults found dead after pesticide poisoning of a waterhole in Waza NP by local poachers in February 2010.

Egyptian Vulture *Neophron percnopterus* EN

Palaearctic migrant and local resident. Groups of 2–19 (mean: 8.8 birds $\pm$ 5.9) were observed each year between 27 November and 24 April in Waza NP, where most were recorded in December–March (90%; n = 118). One adult on 8 May 2007, another on 1 June 2008 and a third-year on 3 July 2010 in Waza NP. Of aged birds in 2006–10, 44% were adults (fourth-year plumage or older; n = 115). Often in groups near waterholes (Fig. 5) and twice at carcasses (goat *Capra aegagrus hircus*, Giraffe *Giraffa camelopardalis*) with Rüppell's *Gyps rueppelli*, Lappet-faced *Torgos tracheliotos* and White-backed Vultures *Gyps africanus*; also seen consuming grasshoppers. Other Waza records include up to four daily in December 1990 (Robertson 1992), ten on 15 November 1993 (Sørensen *et al.* 1996) and a group of 21 on 14 December 1996 (Scholte 1998). Past Nigerian occurrences have also been mainly in December–February (Elgood *et al.* 1966). Apart from these birds, probably of Palaearctic origin (*cf.* Thiollay 1977, 1989), presumed residents were recorded in the Mandara Mountains near Rhumsiki at 1,100 m above sea level, in November and July–August. An adult pair was frequently seen at this locality, once three adults near a dead donkey *Equus asinus*, but no juveniles. Scholte (1998)



Figure 5. Egyptian Vultures *Neophron percnopterus* at waterhole, Waza National Park, Cameroon, 14 January 2007 (Ralph Buij)

Percnoptères d'Égypte *Neophron percnopterus* à un point d'eau, Parc National de Waza, Cameroun, 14 janvier 2007 (Ralph Buij)

concluded that breeding occurred here in 1997, based on a juvenile apparently with two adults on 21 September 1997. Also reported breeding elsewhere in the region (e.g. northern Nigeria: Elgood *et al.* 1994).

Bateleur *Terathopius ecaudatus* NT

Sedentary and local. Most common in national parks (Fig. 6), where encountered at carcasses of Giraffe, Topi *Damaliscus korrigum* and

Waterbuck *Kobus ellipsiprymnus*. Five seen in the Mandara Mountains. Its relative rarity outside national parks corresponds with a significant decline in northern Cameroon in 1973–2000 and away from protected areas in central West Africa since the 1970s (Thiollay 2001, 2006). Threats inside parks include poisoning of carcasses and waterholes, nest disturbance and declining food supplies. Often seen flying repeatedly over recently burnt grasslands, especially in the Bénoué Valley. Relative abundance highest during the rains, with 4.4 birds / 100 km in the inundation zone (dry season: 1.9 birds / 100 km) and 3.2 birds / 100 km in the Bénoué Valley (dry season: 2.4 birds / 100 km). Family groups of adults with juveniles in Waza NP in August–October. A roost of six discovered in Bouba Ndjida NP in April 2010.

Short-toed Snake Eagle *Circaetus gallicus*

Common Palearctic migrant in the inundation zone, October–June. Abundance: 0.7 birds / 100 km in October, 6.7 in November, 4.0 in December, 7.6 in January, 5.8 in February, 2.9 in March and 1.1 in April. Earliest record: 11 October 2008, near Kousseri. Last dates: 24 June 2009 (second-year) and 5–6 May 2010 (two of unknown age), in Waza NP. Widespread but scarcer in lowland grasslands, cultivation and hills south of the inundation zone (one in the Mandara Mountains at c.900 m above sea level). Only snakes recorded as prey (twice), but monitor

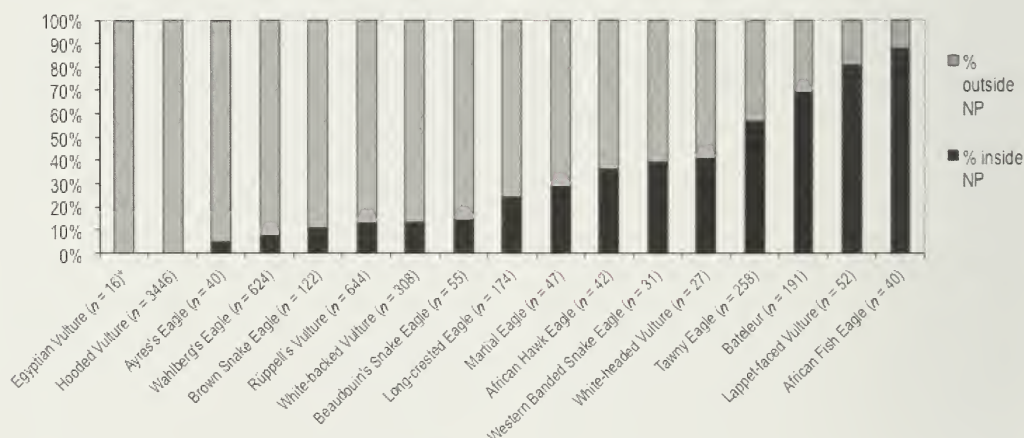


Figure 6. Percentage of Afrotropical eagles and vultures (*n* indicated) counted in and outside the national parks of northern Cameroon, 2006–10. *) only presumed sedentary birds.

Pourcentage d'aigles afrotropicaux et de vautours (*n* indiqué) recensé à l'intérieur et en dehors des parcs nationaux au nord du Cameroun, 2006–10. *) oiseaux présumés sédentaires uniquement.

lizards apparently also important (Thiollay 1977). Three records near Koum, in December (two) and February (one). Wing moult in adults in December–February.

Beaudouin's Snake Eagle *Circaetus beaudouini*
VU

Intra-African migrant. Declined in central West Africa in 1969–2004 (Thiollay 2006), and breeding densities are low but dry-season numbers are traditionally under-recorded due to confusion with Short-toed Snake Eagle (e.g. Elgood *et al.* 1973). Juveniles and (fewer) subadults are widespread but scarce in the inundation zone during the dry season (mean 0.5 birds / 100 km), when *gallicus* is almost ten times more numerous. During this period *C. beaudouini* is widespread and uncommon in the Bénoué Valley (0.1 birds / 100 km), where there are probably no more than c.30 pairs, and in extensive woodlands further south: during the dry season, two were seen on the Adamawa Plateau, south of Ngaoundéré, and records exist south to Mount Cameroon (M. Languy *in litt.* 2013), but no nests have been found. From May (some in April; Fig. 7), adults move north to join juveniles and subadults; the species is then also observed in the Mandara Mountains, but is commonest in the inundation



Figure 7. Adult Beaudouin's Snake Eagle *Circaetus beaudouini* drinking, Waza National Park, Cameroon, 15 April 2010 (Ralph Buij)

Circaète de Beaudouin *Circaetus beaudouini* adulte en train de boire, Parc National de Waza, Cameroun, 15 avril 2010 (Ralph Buij)



Figure 8 (top). Adult Beaudouin's Snake Eagle *Circaetus beaudouini* in moult, Waza National Park, Cameroon, 20 July 2008 (Ralph Buij)

Circaète de Beaudouin *Circaetus beaudouini* adulte en mue, Parc National de Waza, Cameroun, 20 juillet 2008 (Ralph Buij)

Figure 9 (bottom). Juvenile Beaudouin's Snake Eagle *Circaetus beaudouini*, Waza National Park, Cameroon, 25 July 2007 (Ralph Buij)

Circaète de Beaudouin *Circaetus beaudouini* juvénile, Parc National de Waza, Cameroun, 25 juillet 2007 (Ralph Buij)

zone where there is an almost fourfold increase to 1.9 birds / 100 km during the rains (adults then outnumber juveniles / subadults 4:1). Migrants congregate in *Sclerocarya* woodlands south-west of the floodplain, where seasonal pools and patchy, still rather low, grass offer an abundance of accessible prey, especially in June–July. Snakes (30–60 cm) were caught on three occasions in Waza NP, where up to five (juveniles and adults) foraged over a 3-ha area in July. Distance analysis (*cf.* Buij 2013) of 160 km of transect surveys in July 2007–08 in the southern woodlands of the inundation zone (Waza village–Andirni–Pete–

Waza village) produced ≈ 0.19 birds / km², or ≈ 266 individuals if extrapolated to the total area of similar habitat where surveys were conducted ($\approx 1,400$ km²). Three were seen hunting in August in the Far North Region, south of Kousséri. In contrast, none was detected on road transects in June–August in the Bénoué Valley, where four moved north in May. Southbound migration was noted from September, with one adult 10 km south of Garoua. No adults in the Far North Region after November. A nesting record of '*C. gallicus* / *beaudouini*' in December–February in Waza NP by Scholte *et al.* (1999) is unusual in light of these observations. Most adults moulting in July–September (Fig. 8) and fresh juveniles in July (Fig. 9).

Brown Snake Eagle *Circaetus cinereus*

Most common year-round in the Bénoué Valley (mean 2.1 birds / 100 km); often seen perched high above ground on electricity pylons, in shrublands or cultivated areas and relatively few in national parks (Fig. 6). Pairs are widespread but less common in the Sudan zone (0.4 birds / 100 km). Observed in the inundation zone only during the rains (July–August), mostly juveniles. Thiollay (1977) reported it bred frequently at 10–13°N in Nigeria in the 1970s. An adult caught a ≈ 50 -cm snake in cultivated fields west of Tcholliré on 21 March 2009, and another was seen with a snake near Ngaoundéré on 25 June 2008.

Western Banded Snake Eagle *Circaetus cinerascens*

Secretive but frequent in the Bénoué Valley, where year-round resident in savanna and riverine woodlands of Bénoué and Bouba Ndjida NPs, and surrounding hunting zones (year-round abundance: 0.6 birds / 100 km). Single adults and juveniles seen hunting over cultivated areas at the edge of woodland in the Bénoué Valley, especially during the rains, when high grass probably limits prey accessibility. One pair in Bénoué NP was most vocal in June–July, often calling during early morning from a dead tree in riverine forest, but also quite vocal during the dry season (January–April), mainly singing during aerial displays; also heard in March in Faro NP (Dowsett-Lemaire & Dowsett 1999). Only one was observed north of the Bénoué Valley: an adult perched at the edge of woodland near Guider on 15 July 2008. None

in the inundation zone, where three were noted in February / April 1973 (Thiollay 1978a), and two in the 1990s (Kalamaloué NP, February and June: Scholte *et al.* 1999).

White-headed Vulture *Trigonoceps occipitalis* VU
Rare resident in the inundation and Sudan zones (records in October, November, January, February, April–July). Two pairs and second- to fourth-year birds were regularly seen in the woodland zone of Waza NP, where a pair bred in 1969 (Fry 1970) and which was considered part of the small, fragmented western African breeding range by Mundy *et al.* (1992). Single juveniles in Waza NP on 30 November 2008 and 31 December 2006 suggest one or more pairs might still nest in the Far North Region. Other pairs were seen throughout the north, over wooded valleys in the Mandara Mountains, but most commonly in the Bénoué Valley (where on average 0.4 birds / 100 km and recorded in December, February, March, May and August).

Hooded Vulture *Necrosyrtes monachus* EN

Sedentary. Together with Black Kite the commonest raptor in northern Cameroon, where highest abundance year-round in the Sudan savanna zone (36.9 birds / 100 km); several nests in Maroua and near Mokolo, where it breeds in December–June (*cf.* Scholte 1998). Often associated with human settlements, permanent or temporary, few seen in Waza NP, none in the protected areas of the Bénoué Valley but seen in Bénoué and Faro NPs in March 1999 (Dowsett-Lemaire & Dowsett 1999). Mean abundance in the Sudan zone was 38.7 birds / 100 km in January–April vs. 28.4 birds / 100 km in July–September, possibly indicative of some seasonal movements with the rains (*cf.* Thiollay 1977). However, no wet-season influx noted further north. Congregates at slaughterhouses in large towns throughout the region (Maroua, Garoua, Ngaoundéré), where several tens (max. 81 together; Fig. 10), and at termite swarms during the rains also in large towns (e.g. Maroua). Three and a Rüppell's Vulture feeding on a human corpse near Maroua in 2007. Declined 67% in northern Cameroon in 1973–2000 (Thiollay 2001); in 1996 >100 Hooded Vultures died of an unknown cause as some 'literally fell out of the trees' in the town of Maroua (Scholte 1998). Frequently



Figure 10. Hooded Vultures *Necrosyrtes monachus* at slaughterhouse, Maroua, Cameroon, 13 October 2010 (Ralph Buij)

Vautours charognards *Necrosyrtes monachus* près d'un abattoir, Maroua, Cameroun, 13 octobre 2010 (Ralph Buij)

sought for consumption and traditional medicine trade, especially with the disappearance of larger vulture species, and dried individuals, eggs and parts are sold at markets in Garoua and Maroua (Ogada & Buij 2011).

White-backed Vulture *Gyps africanus* EN

Sedentary, but more were seen in the south during the rains. Recorded throughout the region, in groups of up to 37 in the inundation zone, where apparently resident and common year-round with a mean 5.3 birds / 100 km. Declined 60% in 1973–2000 in northern Cameroon (Thiollay 2001). Three pairs nested in Waza NP in December 1971 (Mundy 1972) and it was apparently still 'common to abundant' in the Lake Chad Basin in the 1990s, when six nests with young were found in Waza and Kalamaloué NPs (Scholte 1998). Two occupied nests, one with a fully feathered nestling, in Waza NP in January–April 2006, but none thereafter despite intensive surveys in 2009–10. Interviews with local communities indicate that up to 40 vultures were poisoned at a Waza waterhole in the early 2000s, mostly *Gyps* spp., mainly to supply the traditional medicine trade in Nigeria (Buij & Mohamadou unpubl.). Increased intrusion by poachers and livestock herders may have negatively impacted disturbance-sensitive breeding pairs. According to local reports, nests have been set on fire and poles used to facilitate collection of chicks. At the start of

the rains groups are associated with transhumance nomads and livestock herds moving through the inundation zone, but more commonly associated with the human-populated alluvial plains of the Logone than with the protected woodlands of Waza NP in October–July (Buij & Croes 2013). Also regular year-round throughout the Bénoué Valley, but more common during the wet season (dry season: 0.8 birds / 100 km, wet season: 1.7 birds / 100 km), feeding on carcasses of wild herbivores (e.g. five at a dead Hippopotamus *Hippopotamus amphibius*). Locally common south of Ngaoundéré (cultivation, grasslands, settlements including intensive cattle farms): five in March, eight in May, seven in June, 15 in July, 26 in August and 17 in December.

Rüppell's Vulture *Gyps rueppelli* EN

Sedentary in the Sudan zone; commonest in the south during the rains and in the north in the dry season. The commonest vulture away from protected areas after Hooded Vulture, but it declined 87% in 1973–2000 (Thiollay 2001). Nests were found during the dry season in the Mandara Mountains, especially on and near the peaks at Rhumsiki (at least 17 pairs) and near Mindif (max. 8–10 pairs), where most nests are inaccessible to humans. None was recorded on the more easily accessible Waza Rock or elsewhere in Waza NP. At least 12 pairs nested on Waza Rock in the 1970s (Mundy & Cook 1972), 20–30 pairs in 1993 (Scholte 1998), with two additional pairs at nests in *Acacia* trees and one brooding bird in November–December 1993 (Sørensen *et al.* 1996), but only four nests on Waza Rock in 1997 (Scholte 1998). More common in the dry (4.2 birds / 100 km) than the wet season (1.7 birds / 100 km) in the inundation zone, with large groups in Waza NP in December–April (up to 18 together). Similar numbers year-round in the Sudan zone (6.6 birds / 100 km) suggest breeding pairs there are more sedentary. Counts on 36-km road transect on the Adamawa Plateau south of Ngaoundéré higher during the rains: five in December, 20 in May, 27 in June, nine in August; numbers also higher in the Bénoué Valley during the wet (1.4 birds / 100 km) than the dry season (0.3 birds / 100 km). Groups gathered at wild herbivore (Waza, Bénoué NPs) and livestock carcasses (e.g. 13 on a dead donkey near Guider on 4 June 2008).

Lappet-faced Vulture *Torgos tracheliotos* VU

Almost exclusively seen in the inundation zone, where present year-round (mean 1.6 birds / 100 km), with highest numbers in the dry season. Singles further south near Faro and Bouba Ndjida NP, both in May (another in Faro in March 1999; Dowsett-Lemaire & Dowsett 1999). Observed with Hooded Vultures near nomad settlements, and seen feeding on cow carcasses three times, but a relatively large proportion were inside national parks (Fig. 6). Bred at Waza Rock in the 1970s (Louette 1981), but none thereafter in Waza NP (Scholte 1998). Two pairs bred in Waza NP in 2009–10 atop *Balanites aegyptiaca* trees, with large nestlings in June (Fig. 11) and a fledgling mid July; this suggests that breeding may have either gone unnoticed for a period or has resumed. Three pellets at a nest in Waza NP contained goat hairs; breeding pairs were often seen on foraging trips outside the park. Thiollay (2001) recorded too few to establish a trend in Cameroon, but noted a significant decline in central West Africa

in 1973–2000, with none seen outside protected areas during recent surveys (Thiollay 2006). An exceptional group of 26 was near Kingueroua waterhole in Waza NP on 27 February 2008 (Fig. 12).

Bat Hawk *Macheiramphus alcinus*

Sedentary. Patchily recorded in small numbers throughout the study area; however, probably under-recorded due to the species being mainly active at dawn and dusk. Three pairs and 1–2 juveniles were seen hunting bats at dusk (twice at dawn) year-round above rivers and the tourist camps of Bénoué, Faro and Bouba Ndjida NPs. A minimum of 14 bats caught by two adults during 18 minutes at dusk in February 2008 at Bénoué NP. Previously published records in the Bénoué Valley were from Bénoué NP (several at two localities at least: Robertson 1992, Dowsett-Lemaire & Dowsett 1999), Koum (Louette 1981) and two in Faro NP, including one drinking in mid afternoon (Dowsett-Lemaire & Dowsett 1999). Another adult was seen flying low above ground and on an exposed perch one hour after sunrise in Bouba Ndjida NP in December (Fig. 13). Further north, one flew low over the canopy during the day in Kalfou FR after heavy rains, on 31 August 2009. Juveniles were seen in Waza NP during the day on 5 December 2009 (2), 4 January 2010 (1), and 28 November 2010 (1; Fig. 14). A pair was twice seen hunting bats and circling above Waza village at dusk in July 2010. These complement five records at Waza NP in the 1990s (Scholte *et al.* 1999).



Figure 11 (top). Nestling Lappet-faced Vulture *Torgos tracheliotos*, Waza National Park, Cameroon, 16 June 2009 (Ralph Buij)

Jeune Vautour oricou *Torgos tracheliotos* au nid, Parc National de Waza, Cameroun, 16 juin 2009 (Ralph Buij)

Figure 12 (bottom). Group of 26 Lappet-faced Vultures *Torgos tracheliotos* with Rüppell's *Gyps rueppelli* and White-backed Vultures *G. africanus* at Kingueroua waterhole, Waza National Park, Cameroon, 27 February 2008 (Ralph Buij)

Groupe de 26 Vautours oricous *Torgos tracheliotos* avec Vautours de Rüppell *Gyps rueppelli* et Vautours africains *G. africanus* au point d'eau de Kingueroua, Parc National de Waza, Cameroun, 27 février 2008 (Ralph Buij)



Figure 13 (top). Adult Bat Hawk *Macheiramphus alcinus*, Bouba Ndjida National Park, Cameroon, 28 December 2008 (Ralph Buij)

Milan des chauves-souris *Macheiramphus alcinus* adulte, Parc National de Bouba Ndjida, Cameroun, 28 décembre 2008 (Ralph Buij)

Figure 14 (bottom). Juvenile Bat Hawk *Macheiramphus alcinus*, Waza National Park, Cameroon, 28 November 2010 (Ralph Buij)

Milan des chauves-souris *Macheiramphus alcinus* juvénile, Parc National de Waza, Cameroun, 28 novembre 2010 (Ralph Buij)

Martial Eagle *Polemaetus bellicosus* VU

Sedentary. Rare throughout. Mostly recorded in the Bénoué Valley, where year-round mean abundance 0.7 birds / 100 km, south to c.40 km north of Ngaoundéré. Of 22 aged birds in the Bénoué Valley, 73% were adults. Based on these results and distance sampling along road transects

(Buckland *et al.* 1993) for large (>3 kg) raptors in these savannas (Buij *et al.* 2013c), 106–131 pairs are estimated to occur in the 30,800 km² Bénoué Valley, or one pair per 235–290 km². No adults seen in the inundation zone, where the species was considered an uncommon resident in the 1990s (Scholte *et al.* 1999), but single juveniles, twice seen stooping at groups of Helmeted Guineafowl *Numida meleagris*, were observed in Waza NP in May–July 2009 and 2010. At least two pairs in the Mandara Mountains and one pair at Kalfou FR (where also recorded in 2000: Thiollay 2001), and one pair in the hills c.17 km north-west of Maroua between May and August 2007–09. The species' often large nest, visible from afar, and its habit of occasionally preying on livestock (Buij & Mohamadou unpubl.), increases its vulnerability to persecution and nest disturbance (J.-M. Thiollay pers. comm.).

Long-crested Eagle *Lophaetus occipitalis*

Sedentary. Widespread, but commonest in the Bénoué Valley, where mean 2.7 birds / 100 km; in the inundation zone 1.1 birds / 100 km. Several breeding pairs south and east of Waza NP, and in well-forested parts of the Mandara Mountains. Often perch-hunts in cultivated areas (sorghum, rice, cotton), occasionally near human habitation but close to woodland, and individuals were seen catching rodents on three occasions (near Maga, Tcholliré). An adult caught two frogs within a 25-minute period in July 2009 at Waza NP. Begging fledglings in October in the Bénoué Valley indicates breeding during the rains.

Lesser Spotted Eagle *Clanga pomarina*

Rare Palearctic migrant to the Waza-Logone floodplains with 0–2 individuals observed per dry season. Three over Waza NP, on 23 December 2006 (juvenile), 16 January 2008 (adult) and 5 December 2009, and one over the Logone floodplains north of Maga on 15 March 2010. Previous records: one at Maga on 14 June 1994 (Scholte *et al.* 1999). Thiollay (1978a, 1989) considered it 'quite numerous', but of 82 claimed individuals recorded in the 1970s in northern Cameroon (Thiollay 1978a), most on the Waza-Logone floodplains, an unknown but possibly large proportion were misidentified Steppe Eagles *Aquila nipalensis* (J.-M. Thiollay *in litt.* 2012).

Greater Spotted Eagle *Clanga clanga*

Rare Palearctic migrant. Adult at close range, gaining height near Anane waterhole in Waza NP, on 17 December 2006. Another tentative record in January 2008 in the inundation zone. Only previous records in Cameroon: four in Waza-Logone area in January / April 1973 and four in January / February 2000 (Thiollay 2001), an adult at Maga in February 2000 (M. Languy *in litt.* 2013) and a juvenile in Waza on 11 April 2003 (A. Riley *et al.* in *Bull. ABC* 11: 169).

Tawny Eagle *Aquila rapax*

Partial migrant. Occurs throughout, commonest in the inundation zone, where mean 5.1 birds / 100 km. More than 50% were in national parks (Fig. 6). Least common in the Bénoué Valley during the rains (0.2 birds / 100 km), but more numerous in dry season (0.9 birds / 100 km). Only three seen in August–September in the Far North Region, and none in June–September in the Bénoué Valley suggest northward movements during rains (as in Nigeria: Elgood *et al.* 1973, Thiollay 1977). In groups of up to eight at waterholes in Waza in March–April, four together in rice fields north of Maga in April (both times with Steppe Eagles), and three at a Lion *Panthera leo* kill in Waza NP in May. Four nests in Waza NP, one in Kalamaloué NP, one east of Maroua in farmland, and two (on rocky outcrops and in woodland) in the Mandara Mountains, occupied November–May. Scholte *et al.* (1999) also recorded breeding in Waza and Kalamaloué NPs in December–April. Declined significantly in northern Cameroon in 1973–2000 (Thiollay 2001).

Steppe Eagle *Aquila nipalensis*

Frequent Palearctic migrant to the inundation zone (mean 3.7 birds / 100 km; Figs. 15–16). Of 36 aged birds in October–May, two were juveniles, eight second-years, four third-years, six fourth-years and 16 adults. First arrivals: two juveniles on 24 October 2010; first adult 12 November 2009 in Waza NP. Latest: third-year on 20 May 2008, in Waza NP. Commonly occurs around rice fields in the inundation zone (Buij & Croes 2013), with six together in December 2009 north of Lake Maga, twice seen catching rodents. Rare away from floodplains: one 40 km west of Yagoua on 15 December 2007. Southernmost

records: three together on 21 January 2008 south-west of Tcholliré (08°13'N) and a juvenile in Bouba Ndjida NP on 27 December 2008. These records and those further north (see Ottosson *et al.* 2002) suggest it is a rather common winter



Figure 15 (top). Adult and second-year Steppe Eagles *Aquila nipalensis* at roost, Waza National Park, Cameroon, 31 December 2006 (Ralph Buij)

Aigles des steppes *Aquila nipalensis* adulte et de deuxième année au dortoir, Parc National de Waza, Cameroun, 31 décembre 2006 (Ralph Buij)



Figure 16 (bottom). Fourth-year Steppe Eagle *Aquila nipalensis* in flight over Maga rice fields, Cameroon, 25 December 2006 (Ralph Buij)

Aigle des steppes *Aquila nipalensis* de quatrième année en vol au-dessus des rizières de Maga, Cameroun, 25 décembre 2006 (Ralph Buij)

visitor to the Lake Chad Basin. However, only two juveniles were noted in the Waza-Logone area in the 1990s, in February and May (Scholte *et al.* 1999), with nine there in 2000 (Thiollay 2001).

Eastern Imperial Eagle *Aquila heliaca* VU

Rare Palearctic migrant. Nine records in the inundation zone, eight of them in Waza NP, involving at least five birds: adult over Douroubatassa waterhole on 23 December 2005; juvenile in the western section of Waza NP on

30 December 2006, 22 February and 18 March 2007 (Fig. 17); juvenile in Waza NP on 15 and 17 January and 29 February 2008 (Fig. 18), pirating food from a Pied Crow *Corvus albus*; fourth-year there on 17 January 2008; and juvenile or second-year north of Lake Maga on 2 February 2009. Previously published records in Cameroon: singles in Waza NP in November 1993 (Sørensen *et al.* 1996), Kalfou FR in February 2000 (Bobo & Njabo 2000) and Tchabal Ngandaba in April 2000 (Njabo *et al.* 2000). Another juvenile was seen at Lake Chad on 14 November 2001, in Nigeria, just west of the border with Cameroon (Velmala & Gustafsson 2003).

African Hawk Eagle *Aquila spilogaster*

Sedentary. Scarce throughout, commonest in the Bénoué Valley (*cf.* Robertson 1992, Sørensen *et al.* 1996, Dowsett-Lemaire & Dowsett 1999), where 0.8 birds / 100 km, often in national parks (Fig. 6), along river courses, and in surrounding ecotone of farmland and woodland. A few pairs perhaps still breed throughout the Sudan zone in hilly terrain with forest remnants, such as the lower Mandara Mountains, where nest sites and small game (guineafowl, francolins, hyrax) are more secure from human hunting. No adults seen in the inundation zone but up to four juveniles recorded annually (1 June–28 November; Fig. 19), often hunting (young) Rock Hyrax *Procapra*



Figure 17 (top). Juvenile Eastern Imperial Eagle *Aquila heliaca*, Waza National Park, Cameroon, 18 March 2007 (Ralph Buij)

Aigle impérial *Aquila heliaca* juvénile, Parc National de Waza, Cameroun, 18 mars 2007 (Ralph Buij)

Figure 18 (bottom). Juvenile Eastern Imperial Eagle *Aquila heliaca* chasing Pied Crow *Corvus albus*, Waza National Park, Cameroon, 15 January 2008 (Ralph Buij)

Aigle impérial *Aquila heliaca* juvénile poursuivant un Corbeau pie *Corvus albus*, Parc National de Waza, Cameroun, 15 janvier 2008 (Ralph Buij)



Figure 19. Juvenile African Hawk Eagle *Aquila spilogaster*, Waza National Park, Cameroon, 28 November 2008 (Ralph Buij)

Aigle fascié *Aquila spilogaster* juvénile, Parc National de Waza, Cameroun, 28 novembre 2008 (Ralph Buij)

capensis and birds, also eating wild figs on rocky outcrops near Waza NP, particularly in July–August. Few previous records in the Waza-Logone area: two in February / April 1973 (Thiollay 1978) and two in the 1990s, in September and December (Robertson 1992, Scholte *et al.* 1999). Primary moult in an adult in March and another in April.

Wahlberg's Eagle *Hieraaetus wahlbergi*

Short- and long-distance intra-African migrant. Found throughout in the dry season, most commonly in the inundation zone (3.8 birds / 100 km), south to 07°19'N in December (but dry-season records to the coast) and mostly outside national parks (Fig. 6). Numbers increase during the rains (Fig. 20), when migrants from southern Africa visit the region, as revealed by two satellite-tracked females from Namibia and South Africa that reached northern Cameroon / north-east Nigeria and south-east Chad, respectively, in late April–May, remaining until mid August (Meyburg *et al.* 1995). Other examples of trans-equatorial migration are of birds ringed in southern Africa recovered in Sudan in April and in Democratic Republic of Congo in August–September (Oatley *et al.* 1998). In the Bénoué Valley, numbers peak with the arrival of short- and long-distance migrants (May), but thereafter decrease sharply,

subsequently peaking in the Sudan zone (June) and the inundation zone (July–August; Fig. 20) corresponding with the later start to the rains at higher latitudes. Numbers decline in November–April in the inundation and Sudan zones, but gradually increase in the Bénoué Valley during this period, while most records in the savanna–forest transition zone and all those from the south-east are in the dry season (M. Languy *in litt.* 2013), supporting the hypothesis that local birds move to southern savannas in the dry season. Wahlberg's Eagle breeds from June in *Sclerocarya* woodlands of the inundation zone at a mean density of one pair per 13 km² (40 km² surveyed). Aerial displays in the inundation zone were mostly observed from June. Four occupied nests were found, one in a large *Faidherbia albida* among cotton fields near Mora on 9 August 2009. One eagle was <100 m from the nest, the other on the nest rim. Three occupied nests with 1–2 adults in attendance, two containing one egg each (12 and 17 July 2010), were within and just south of Waza NP. Given a c.4-month period from laying to fledging (Ferguson-Lees & Christie 2001), nestlings fledge in late September–early November when fires increase accessibility of abundant terrestrial vertebrate prey (Thiollay 1978). All nests were lined with green leaves and sited below the canopy of tall *Sclerocarya birrea*

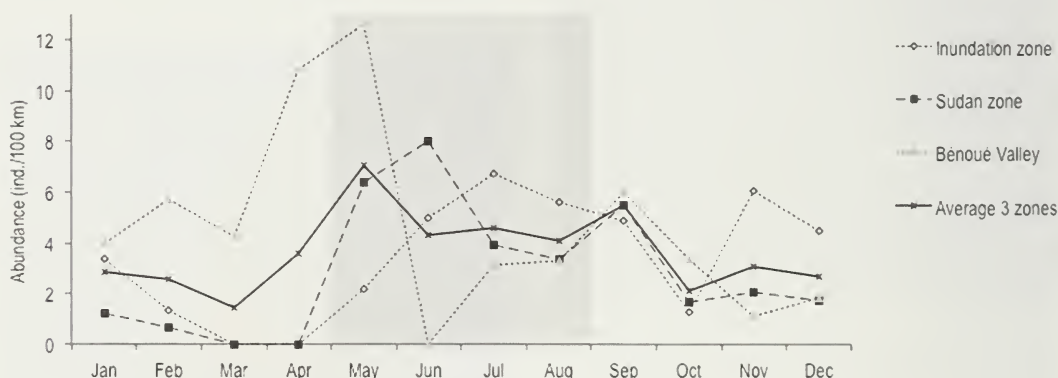


Figure 20. Wahlberg's Eagle *Hieraaetus wahlbergi* monthly abundance in the three savanna zones of northern Cameroon, and mean abundance for the three zones, based on transect counts 2007–10. The grey block indicates the approximate period spent in northern Cameroon and Nigeria by a satellite-tracked Wahlberg's Eagle that bred in Namibia (source: Meyburg *et al.* 1995)

Abondance mensuelle de l'Aigle de Wahlberg *Hieraaetus wahlbergi* dans les trois zones de savane au nord du Cameroun, et abondance moyenne pour les trois zones, basée sur les recensements le long des transects en 2007–10. La partie en gris indique la période approximative passée au nord du Cameroun et au Nigeria par un Aigle de Wahlberg muni d'une balise Argos qui avait niché en Namibie (source: Meyburg *et al.* 1995)

trees, which is typical for Wahlberg's Eagle but does not exclude Long-crested Eagle *Lophaetus occipitalis* (R. Simmons & W. Tarboton *in litt.* 2013). Thiollay (1977) recorded nesting pairs in western Africa during the rains at 12°–14°N and saw birds on nests or bringing prey (J.-M. Thiollay *in litt.* 2013), but did not publish details. Two breeding records in Nigeria (by P. Ward & M. Dyer) perhaps best considered uncertain (Brown *et al.* 1982; F. Dowsett-Lemaire *in litt.* 2013), while a record of an occupied nest (female present in June–July) during the rains at Makalondi, south-west Niger, observed over a 14-year period, is unpublished (Souvairan 1990). Two pairs defending seemingly exclusive territories, with two adults accompanied by a begging juvenile, displaying and calling on the Obudu Plateau in south-east Nigeria (06°38'N), just west of the border with Cameroon, in February 2001 (Bijlsma 2001) indicate that dry-season records at southerly latitudes include adults and juveniles. We conclude that Wahlberg's Eagles breeding in the Sahel are unlikely to originate from southern Africa, but instead perform shorter-distance seasonal movements entirely within the region (*cf.* Meyburg *et al.* 1995), visiting the forest–savanna mosaic or further south in the dry season and moving north after the first rains to breed. Food: congregates at alate termite or ant swarms in June and in larger groups at fires during the dry season in the Bénoué Valley. Seen with an Agama *Agama agama* near Mora on 13 January 2008 and with a lizard on 25 July 2008 in Kalfou FR.

Booted Eagle *Hieraetus pennatus*

At least 370 observations of this, the second-commonest Palearctic migrant, with a mean dry-season abundance of 9.3 birds / 100 km in the inundation zone. First arrival on 11 October 2008; latest date: 21 April 2007 (two). Relative abundance in the inundation zone: 0.6 birds / 100 km in October, 9.4 in November, 9.9 in December, 10.5 in January, 8.1 in February, 7.0 in March and 2.7 in April. The commonest Palearctic migrant in the Sudan zone during the dry season (3.9 birds / 100 km), and in the Bénoué Valley south to Ngaoundéré. Often seen hunting over rocky outcrops (where abundant reptiles, francolins, doves etc.), near villages (pigeons, lizards, poultry, rodents) and at waterholes (birds); numbers relatively high in rice fields in the



Figure 21. Booted Eagle *Hieraetus pennatus* with rodent, south of Waza National Park, Cameroon, 15 January 2007 (Ralph Buij)

Aigle botté *Hieraetus pennatus* avec un rongeur, au sud du Parc National de Waza, Cameroun, 15 janvier 2007 (Ralph Buij)

inundation zone (Buij & Croes 2013), where observed catching rodents (*Arvicanthis*, *Mastomys* spp.) seven times (Fig. 21), typically by hanging into the wind and dropping down in a (staggered) stoop or shallow dive on closed wings. One caught a chicken south of Waza, with another two unsuccessful attempts observed on poultry near villages, in January–March. Thiollay (2001) recorded a significantly higher abundance in northern Cameroon in 2000 compared to 1973. Once recorded during the Palearctic summer, on 21 June 1994 (Scholte *et al.* 1999).

Ayres's Eagle *Hieraetus ayresii*

Partial migrant. Fifty individuals recorded; no dark morphs. Two to three pairs in the Bénoué Valley and the Mandara Mountains. Compared to other Afrotropical eagles, a relatively large proportion was seen outside national parks (Fig. 6). In the dry season, records in October (one), November (three), December (three), January (two), March (three) and April (two), near Boubu Ndjida NP, Poli, Tcholliré and in the Mandara Mountains. More common and widespread during the rains (6 May–1 September; 36 individuals): in the surroundings of Garoua (14), the Mandara Mountains (seven) and the Bénoué Valley (eight), with singles in Waza NP on 20 June, 22 July and 27 July 2010 (first published records this far north), near Maroua on 24 July 2010, near Kaélé on 31 July 2008, Moutourwa on 1 September

2008, and 10 km north of Ngaoundéré on 27 July 2007. Of birds of known age, 17 were adults and eight juveniles / immatures. The presence of adults in the inundation zone during the rains suggests that birds from the forest zone, where the species is fairly common and probably under-recorded (Clark 1999), move north with the rains in the non-breeding season. Often seen hunting over farmland, villages and deforested hillsides, also large towns (e.g. Garoua, Figuil); an adult was captured in a village north-east of Garoua and brought to Garoua Zoo where it later died (collection Ecole de Faune, Garoua). One subadult attempted to capture feral pigeons *Columba livia* in a small village north of Garoua on 24 June 2007 (Fig. 22) and an adult stooped at a group of six domestic pigeons in a village north-west of Tcholliré on 28 December 2008. An adult stooped at unseen prey in *Acacia* woodland of Waza NP in July 2010 (Fig. 23). Another adult stooped at a group of 12 Cattle Egrets *Bubulcus ibis* in the Mandara Mountains and was subsequently harassed by a Fox Kestrel *Falco alopex* and a Dark Chanting Goshawk *Melierax metabates* on 19 June 2008. Primary moult in three adults in the north in June–August.



Figure 22 (left). Second-year Ayres's Eagle *Hieraaetus ayresii*, north of Garoua, Cameroon, 24 June 2007 (Ralph Buij)

Aigle d'Ayres *Hieraaetus ayresii* de deuxième année, au nord de Garoua, Cameroun, 24 juin 2007 (Ralph Buij)

Figure 23 (right). Adult Ayres's Eagle *Hieraaetus ayresii*, Waza National Park, Cameroon, 25 July 2010 (Ralph Buij)

Aigle d'Ayres *Hieraaetus ayresii* adulte, Parc National de Waza, Cameroun, 25 juillet 2010 (Ralph Buij)

Lizard Buzzard *Kaupifalco monogrammicus*
Sedentary. Recorded throughout but most frequently in the Bénoué Valley (0.8 birds / 100 km), where more commonly detected (more vocal, also in flight) during the rains, perched in dense woodland or in cultivated fields, or circling high. Two in the Mandara Mountains and one circling near Yagoua. First records in the Waza-Logone area: singles on 23 December 2006, 2 March 2007, 24 November 2009 and 14 May 2010, perched in *Sclerocarya* woodland of Waza NP and once drinking at Louloubaya waterhole. One near Mora on 22 March 1990 (Robertson 1992).

Dark Chanting Goshawk *Melierax metabates*
Sedentary. Throughout the region, commonest in the inundation zone (mean 12.9 birds / 100 km) and declining southwards (mean 2.3 birds / 100 km in the Bénoué Valley). Highest densities occur on raised areas with *Faidherbia albida*, *Hyphaene thebaica* and *Borassus aethiopum* trees surrounded by seasonally flooded grasslands along the Logone River (Buij & Croes 2013), but also frequently seen over rice fields and dry *Sclerocarya* and *Acacia* woodlands to the south and west. Adult males in dry woodlands had mean dry-season ranges of 1.5 km² (range: 0.57–2.52 km²; significantly larger outside than in Waza NP: Buij 2013), but evidence suggests that range size is much larger in the less productive wooded grasslands of the higher Sudan zone (c.7 km² for a male south of Mora: unpubl. data). Nest building and courtship feeding of female by male from February / March in the Far North Region, vocal in early morning hours in January–April. Fledgling near nest on 2 May 2009 in Waza NP, a nest with one nestling of c.2 weeks on 8 May 2009, four nests with one egg each on 7–13 May 2010, and two nests with one nestling (1–2 weeks) on 17 May 2010 (*contra* Scholte *et al.* 1999, who assumed breeding during August–November). Dependent fledglings (food begging) until mid August in the inundation zone. Nest trees: *Balanites aegyptiaca* (six nests), *Faidherbia albida* (three) and *Sclerocarya birrea* (two). Food in the Far North Region mainly reptiles (lizards, some snakes) and rodents, few birds and insects (Buij 2013). Parasitic attacks noted by adults on Black-winged Kites and Booted Eagles with rodent and bird prey. Mean weight of 17 males 553 ± 26 g (range: 518–612 g) and of 12 females 660 ± 55 g (587–767 g). Declined 62%

in 1973–2000 in northern Cameroon (Thiollay 2001), possibly due to increased nest disturbance and declining vegetation cover and prey biomass in unprotected areas (Buij 2013).

Gabar Goshawk *Micronisus gabar*

Sedentary. Commonest in the inundation zone (3.8 birds / 100 km) and especially associated with seasonally flooded plains along the Logone (Buij & Croes 2013), with smaller numbers further south (0.7 birds / 100 km in the Bénoué Valley). Dark and grey morphs recorded throughout. On average one occupied nest per 5 km² in the protected and cultivated woodlands in and around Waza NP (40 km²), April–July 2010. Also breeds in the centre of villages (nests recorded in Maroua, Rhumsiki and Kousseri). An adult observed catching a young domestic chicken *Gallus gallus* in a village south of Mora, in January 2008. Nestlings at three nests (Fig. 24), and two nests with eggs (1–3), in *Sclerocarya birrea* trees in and south of Waza NP, in May 2009 and 2010, and begging juveniles in Kousseri in June. Congregates at waterholes in Waza in the dry season, where it is one of the commonest raptors (up to seven together), drinking, and two to three simultaneously chasing Red-billed Quelea *Quelea quelea* flocks.

Western Marsh Harrier *Circus aeruginosus*

Commonest Palearctic raptor, noted in all months except July–August with a mean dry-



Figure 24. Nestling Gabar Goshawk *Micronisus gabar*, Waza National Park, Cameroon, 10 May 2010 (Ralph Buij)

Jeune Autour Gabar *Micronisus gabar* au nid, Parc National de Waza, Cameroun, 10 mai 2010 (Ralph Buij)

season abundance of 23 birds / 100 km in the inundation zone, but far less numerous in the drier Sudan zone and Bénoué Valley (0.4 and 0.6 birds / 100 km, respectively). Together with Booted Eagle *Hieraetus pennatus* exceptionally stable in terms of abundance in Sudan and Sahel zones of central West Africa and northern Cameroon in 1969–2004 (Thiollay 2001, 2006). Exploits moist or shallowly flooded grasslands in September–November, but thereafter fires, grazing and retreating floods concentrate food resources, for example near water or in crops (e.g. rice; Buij *et al.* 2012) and numbers shift in response to spatio-temporal variations in food availability (Buij & Croes 2013). Common from 15 September, when 22 birds / 100 km in moist, partially cultivated grasslands south of Kousseri (southernmost record: 15 September 2009, five at 11°84'N 14°61'E), 99 birds / 100 km in October, declining to 37 birds / 100 km in November and 7–11 birds / 100 km in December–March. From November, with drying of grasslands and increasing fires, Western Marsh Harriers exploit crop fields and rich grasslands of the seasonally inundated floodplain along the Logone River, and the margins of wet depressions and Lake Maga, where they feed primarily on diurnal rodents, but also on grasshoppers, reptiles and birds (Buij *et al.* 2012). Over the course of the dry season, more strongly associated with extensive rice cultivation than grassland habitats in the Waza-Logone floodplain (Buij & Croes 2013), but also frequents drier habitats away from it. Observed hunting frogs in October–November and scavenging dead fish twice in the late dry season. Apart from small passerines (notably Red-billed Quelea *Quelea quelea*), avian prey included a Common Snipe *Gallinago gallinago* and adult male Common Kestrel *Falco tinnunculus*, with failed attempts to predate Ruff *Philomachus pugnax* and White-faced Whistling Duck *Dendrocygna viduata* observed. Of 804 individuals aged and / or sexed in the Waza-Logone area in January–March 2009–10, 21% were adult males, 27% adult females and 52% juveniles. Late records: juvenile / female high over Maroua on 30 May 2010, two juveniles quartering rice fields near Maga on 2 June 2007, and two juveniles near Kousseri on 12 June 2008. Last record of an adult male was 17 March 2010, near Maga, but adult males do over-summer in the Sahel (Thiollay 1977).

Pallid Harrier *Circus macrourus* NT

The least common Palearctic harrier in October–April in the inundation zone, where mean 3.2 birds / 100 km, but also further south. Southernmost record: south of Mbe (07°48'N 13°33'E), 7 March 2008. Earliest and latest records of juveniles: 10 October 2008, near Maroua, and 14 April 2007, Waza NP. Earliest and latest records of adult females: 16 November 2008, near Moutourwa, and 5 April 2006, Waza NP; and of adult males: 12 October 2008, near Mora, and 17 March 2008, Waza NP. First arrival reported by Scholte *et al.* (1999) on 18 September 1994. Of 564 birds aged and / or sexed in 2005–10, 25% were adult (> second-year) females, 21% adult males and 54% juveniles. Juveniles dominate winter populations in early and late dry season (Fig. 25a). Of those juveniles sexed ($n = 112$), 53% were females and 47% males. Rice fields with abundant rodents are an important foraging habitat in November–April (Buij & Croes 2013) and the species is relatively more frequent in dry grasslands than other harriers (Buij *et al.* 2012). Detailed observations in January–March revealed that adult males foraged more frequently over seasonally flooded grasslands than dry rice fields, whereas adult females not only foraged more often but also for longer periods over rice than flooded grasslands, probably reflecting intersexual dietary differences (Buij *et al.* 2012). Food: grasshoppers (on freshly burnt grasslands) and birds (more frequently targeted by males: Buij 2012), including Ethiopian Swallow *Hirundo*

aethiopica, also reptiles, but biomass dominated by rodents (Buij *et al.* 2012). No significant decline in northern Cameroon in 1973–2000 (Thiollay 2001), but few seen in both periods (16 and 11 individuals, respectively), making trends difficult to evaluate and decline was noted further west (Thiollay 2006). Previously reported rarity in comparison to Montagu's Harrier *Circus pygargus* (which see) suggests that numbers may have been under-estimated due to identification difficulties and, possibly, lower detectability of Pallid Harrier, which often hunts closer to the ground, sometimes in ditches (rice fields) or through denser vegetation (pers. obs.) than Montagu's Harrier.

Montagu's Harrier *Circus pygargus*

Palearctic migrant, October–April. More common than Pallid Harrier, with mean 5.2 birds / 100 km in the inundation zone, where abundance along transects: 0.2 birds / 100 km in October, 2.7 in November, 1.8 in December, 10.0 in January, 8.4 in February, 4.7 in March and none in April. One satellite-tracked adult female from Belarus frequented the inundation area in December (arrival: 10–12th) to February 2007/08, 21–29 November 2008 and December (arrival: 4th) to February 2009/10, but not in 2010/11 (Dutch Montagu's Harrier Foundation unpubl.). Numbers four times greater than *C. macrourus* (65 vs. 16) along road transects in northern Cameroon in the 1970s (Thiollay 2001). However, *C. pygargus* comprised 59% of combined numbers in northern Nigeria in 1968–73 (Thiollay 1977),

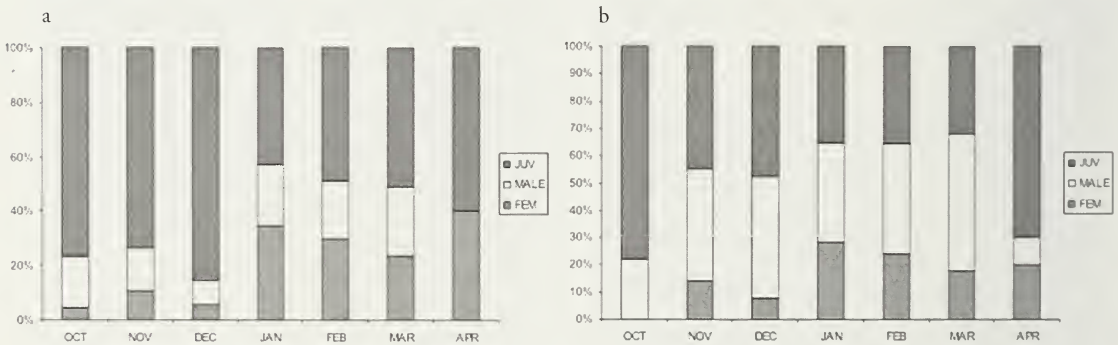


Figure 25. Age and sex composition of (a) Pallid *Circus macrourus* ($n = 564$ birds) and (b) Montagu's Harriers *C. pygargus* ($n = 805$) wintering in northern Cameroon in October–April. Birds were recorded throughout the study area in 2005–10.

Composition par âge et sexe des (a) Busards pâles *Circus macrourus* ($n = 564$ individus) et (b) Busards cendrés *C. pygargus* ($n = 805$) hivernant au nord du Cameroun en octobre–avril. Les oiseaux ont été recensés sur toute la zone d'étude en 2005–10.

which is comparable to the proportion along road transects in northern Cameroon in 2007–10 (67% *pygargus*; $n = 168$). Other reports from Waza NP probably over-estimated relative abundance of *pygargus*: up to 15 daily vs. only two *macrourus* in December 1990 (Robertson 1992) and 20 daily vs. four *macrourus* in November 1993 (Sørensen *et al.* 1996). Southernmost record: juvenile on 24 December 2008 south of Mbe (07°49'N). Of 808 birds aged and / or sexed in 2005–10, 20% were adult females, 42% adult males and 38% juveniles; males consistently commoner than females throughout the dry season (Fig. 25b). Of those juveniles sexed ($n = 153$), 52% were males and 48% females. Pellet analysis reveals that prey comprises mainly grasshoppers, but also reptiles, birds and rodents (Buij *et al.* 2012). First arrival of juveniles: 11 October 2008, Waza NP (one). Latest dates for juveniles (all single males): 6 May 2007 and 25 May 2009, Waza NP, and 30 May 2010, near Maroua. Earliest and latest records of adults: females on 15 November 2007, Waza NP, and 15 April 2007, near Maroua; males on 20 October 2007 and 2 April 2006, both in Waza NP. No wet-season records though known to over-summer (Thiollay 1977). West African floodplains are important wintering grounds (Thiollay 1977), and females are attracted to dry rice fields but embankment of the Logone River has probably negatively impacted foraging conditions especially for males (Buij *et al.* 2012). Abundance in 1973–2000 similar (Thiollay 2001), but declined further west during approximately same period (Thiollay 2006).

Shikra *Accipiter badius*

Intra-African migrant. Observed year-round at all latitudes but movements probably most evident north and south of the study area (Elgood *et al.* 1973, Thiollay 1978b). Commonest in the Bénoué Valley, where mean dry-season abundance 2.4 birds / 100 km, and in wet season 2.1 birds / 100 km. More commonly seen during rains (May–August) in the inundation zone (wet-season abundance: 0.6 birds / 100 km, dry season: 0.3 birds / 100 km) and Sudan zone (1.0 bird / 100 km vs. 0.3 birds / 100 km in dry season), indicating an influx from the south. Breeds in the Bénoué Valley during the dry season, where courtship, mating and three nests with one, two and two eggs, respectively, in January–February.

Also breeds in May–July in the Far North Region, where fledglings recorded in July–August. Five nests in the centre of large towns (e.g. Maroua) during the rains. These observations support the theory that the region's Shikras have an extended breeding season covering both seasons (Elgood *et al.* 1973): some move north with the rains and breed when the rains start in the north, whereas others breed at more southerly latitudes in the dry season. Individuals caught agamas and skinks on and near houses in Maroua, Figuil and Waza. Adults and juveniles seen foraging together on alate termites, ants and grasshoppers in June–July in the Far North Region.

Levant Sparrowhawk *Accipiter brevipes*

Rare Palearctic migrant. Two adult females, circling near Poli and over Bénoué NP on 14 and 15 April 2010, were identified by their dark brown upperparts, densely barred rusty brown underparts including lower belly (darker than Shikra), rather narrow 'arm' and pointed 'hand' compared to Shikra, with dark cheeks and dark iris of one female seen clearly. A juvenile near Guider on 23 April 2010 and another at the entrance to Bouba Ndjida NP on 17 April 2010 were also tentatively identified as this species. A male claimed from Waza NP in October 1992 (Skeen 1993) and another tentatively identified there in January / February 2000 (Thiollay 2001). Other published records in the region: Niger, 19 February and 27 May (Thiollay 1977).

Red-thighed Sparrowhawk *Accipiter erythropus*

Rare sedentary *Accipiter*. One seen at close range in typical *Accipiter*-like flight 5 m above the ground, on 27 December 2008 in open woodland near a large seasonal river within Bouba Ndjida NP. Northernmost record in Cameroon, the nearest being from the Bamenda Highlands (Louette 1981), but reported to nearly 10°N in Nigeria (Elgood *et al.* 1994). In Ghana occurs in the forest zone but is especially well represented in the forest / savanna transition zone, north to 08°–08°30'N, mainly in riparian forest (F. Dowsett-Lemaire *in litt.* 2013).

Ovambo Sparrowhawk *Accipiter ovampensis*

Probably sedentary. Five adults seen, all in the Bénoué Valley in February–June, coinciding with the breeding season (Mills *et al.* 2003) when the



Figure 26. Adult Ovambo Sparrowhawk *Accipiter ovampensis* circling with prey, near Poli, Cameroon, 8 March 2008 (Ralph Buij)

Épervier de l'Ovambo *Accipiter ovampensis* avec une proie près de Poli, Cameroun, 8 mars 2008 (Ralph Buij)

species is perhaps more conspicuous. Records as follows: one drinking in the Bénoué River on 14 February 2007; one circling over savanna woodland near Tcholliré on 13 May 2007; a dark morph c.60 km south of Banda on 7 March 2008 (catching a swallow *Hirundo* sp. and subsequently harassed by a Fox Kestrel *Falco alopex*); one in flight with prey east of Poli on 8 March 2008 (indicative of breeding; Fig. 26); and one c.30 km north of Banda on 24 June 2008. Previous records include a pair nest building in Bénoué NP in March 2003 (Mills *et al.* 2003), and a specimen from Poli, dated September 1936 (Louette 1981). Records considered doubtful by us include one in Kalamaloué NP in April–May 1992 (Scholte *et al.* 1999) and two near Yagoua in 2000 (Thiollay 2001).

African Fish Eagle *Haliaeetus vocifer*

Sedentary. Most frequent along large rivers in the Bénoué Valley, where mean 0.3 birds / 100 km along road transects under-estimates abundance along rivers; a nest was occupied during the dry season in 2008–10 near the Bénoué River c.30 km north-west of Tcholliré. Most records in the Far North Region were inside Waza NP, where two pairs were attending nests in December–May and juveniles and subadults were present in April–June 2007–09. Subadult and juvenile near Kousseri and Double (July), probably reflecting dispersal from Waza NP, and an adult near Maga (December), but relatively few outside national parks (Fig. 6). A lack of large trees may explain its rarity near Lake Maga (Thiollay 2001). Has declined significantly outside protected areas in

the Sudan and Sahel zones of central West Africa since the 1970s (Thiollay 2006), when declines were already apparent (Thiollay 1977). Thiollay (2001) observed 48 individuals on 466 km of road transects, i.e. 10.3 birds / 100 km, in northern Cameroon's inundation zone (Waza NP, Mora-Waza, Pousse-Yagoua) during the dry season of 1973 vs. a dry-season abundance of 1.0 bird / 100 km in the same area in 2000 (January–February); abundance on the same transects in 2007–08 (January–February) was 1.6 birds / 100 km, suggesting numbers remained stable in 2000–08 but at a much lower level compared to 1973. Throughout, but notably also within Waza NP, pairs are under threat from overfishing of waterholes by local communities, as well as increased disturbance at nest sites and contamination of water sources (*cf.* African Harrier Hawk *Polyboroides typus*).

Black Kite *Milvus migrans*

Common to locally abundant intra-Africa migrant (*M. m. parasitus*, Yellow-billed Kite), throughout the Far North Region but south of Garoua only in small numbers in cultivated habitats, villages and towns (e.g. Ngaoundéré). Although it remains common today, a significant decline was noted between 1973 and 2000 in northern Cameroon (Thiollay 2001). A small number of Palearctic Black Kites (nominate *migrans*, <1% of total numbers) was identified, November–April, mostly in the inundation zone; possibly under-recorded due to difficulties in distinguishing between races. Relative abundance highest during the dry season in the inundation zone, when 108 birds / 100 km, but a mean 43 birds / 100 km in the wet season, when most abundant on the partially flooded grasslands north of Waza NP (166–386 birds / 100 km in July–September between Waza and Kousseri). During the dry and early wet season (October–July), which coincides with the breeding season in the inundation zone, more commonly associated with dry, protected woodlands, with sufficient nest-site availability, than cultivated grasslands, rice crops or flooded grasslands (Buij & Croes 2013), although large groups of non-breeders may forage over burnt rice fields and floodplains. Few remain in the Sudan zone in August–September, and the Bénoué Valley is completely vacated in May–September, indicating northwards movement with the rains

into the Sahel as previously described (Elgood *et al.* 1973, Thiollay 1977). Two large roosts with several hundred birds each in Waza NP and north of Lake Maga, December–February, and 2–5 roosts with several tens north of Waza in August–September. Exploits alate termites and ants in foraging groups of 200–300 birds at the start of the rains in May–June in the inundation zone, insects and small vertebrates in October–January at fires, meat scraps at slaughterhouses (Mokolo, Maroua, Ngaoundéré, Garoua) and fish remains at markets (Maga). Breeds in dry woodlands within and (less commonly) around Waza NP in March–July (one occupied nest per 6.7 km² in 2009/10), but breeding may start earlier; one nest with two eggs on 2 May 2009 in Waza NP, another with two eggs there on 27 May 2010 and two nests with one 4–5 week old-nestling each, 10 and 20 May 2009. Nests were lined with plastic bags, cloth and pieces of dry livestock skin.

Grasshopper Buzzard *Butastur rufipennis*

Intra-African migrant, between c.08°30 and 12°N (Thiollay 1977). Commonest raptor in northern Cameroon after Black Kite and Hooded Vulture (Buij *et al.* 2013b), with 29.6 birds / 100 km in the dry season and 56.4 birds / 100 km during the rains in the inundation zone, where it comprises 9% and 24% of the raptors in the dry and wet seasons, respectively (Buij *et al.* 2013b). Vacates the Bénoué Valley from April (dry-season abundance: 15.3 birds / 100 km), although some linger until June, when five were observed; none in July, when the entire population has moved north. Breeds in high densities at the start of the rains, in April–July, in *Sclerocarya birrea* woodland inside (mean nest density: 3.3 nests / km²) and around Waza NP (2.4 nests / km²; Buij *et al.* 2013e); between October–July, more strongly associated with dry woodlands inside and outside Waza NP than flooded grasslands or rice fields (Buij & Croes 2013), because nest site and terrestrial prey availability are comparatively high in woodlands. Soon after breeding, the entire population moves north into the Sahel (July–September). Returns south in October–November with decreasing vegetation cover due to fires and grazing, which improves prey accessibility (Thiollay & Clobert 1990), south to the forest zone, but observed in the inundation zone until January. Feeds on reptiles, insects, rodents, birds,

amphibians and arachnids during the breeding season (Buij *et al.* 2013d). Insects comprise mainly (large) grasshoppers: of 118 pellets examined, 25% contained remains of large-bodied bird locusts *Ornithacris cavroisi*. Non-breeding diet consists mainly of grasshoppers, alate termites and other insects, with one carrying a lizard on 2 May 2008 in Bénoué NP. Nest success at a sample of 244 nests in 2009–10 was comparable between woodlands of Waza NP and surrounding cultivated dry woodlands, suggesting Grasshopper Buzzards cope well with habitat modification (Buij *et al.* 2013e). However, loss of tree and grass cover in important breeding areas, possibly in addition to changing rainfall patterns, may threaten future productivity, and nestling condition is negatively affected by anthropogenic land use (Buij *et al.* 2013d). During the non-breeding season, appears to benefit from disturbance regimes (cultivation, fires, grass-cutting) that improve prey availability. Inner primary moult in breeding adult females noted in June–July, in males probably later, indicating that birds shed flight feathers during migration.

Red-necked Buzzard *Buteo auguralis*

Intra-African migrant. Breeds during the dry season in the Bénoué Valley (2.5 birds / 100 km) and Sudan zones (1.1 birds / 100 km), often in well-wooded areas, on rocky hills but also in woodland on undulating hills (Bénoué NP). Entire population moves north with the rains, when the highest mean abundance is in the Sudan zone (4.3 birds / 100 km). During this influx, abundance increases in the inundation zone from 0.4 birds / 100 km in the dry season (none in January–April) to 1.4 birds / 100 km in the wet season, north to Kousseri, with numbers peaking in June–September (majority juveniles / subadults). None in the Bénoué Valley in July–September. These movements north with the rains are similar to those previously described from Nigeria (Elgood *et al.* 1973). Diet in the inundation zone lizards, rodents, eggs (e.g. of Grasshopper Buzzard: Buij *et al.* 2013e), nestlings and wild figs. Juveniles moulting inner primaries and rectrices in April.

Common Buzzard *Buteo buteo*

Rare Palearctic migrant. Singles of race *vulpinus* between Waza and Kousseri on 23 December



Figure 27. Juvenile Common Buzzard *Buteo buteo vulpinus*, Waza National Park, Cameroon, 17 October 2010 (Ralph Buij)

Buse variable *Buteo buteo vulpinus* juvénile, Parc National de Waza, Cameroun, 17 octobre 2010 (Ralph Buij)

2007 (not aged) and 10 October 2008 (juvenile), and a juvenile flew over a rocky outcrop just west of Waza village on 17 October 2010 (Fig. 27). Finely barred whitish secondaries and rufous body and tail in two birds; juveniles have indistinct dark trailing edge to wings. Smaller than Long-legged Buzzard *B. rufinus*, with more rapid flight action, relatively thickset body and shorter wings, lacking the contrasting dark carpal patch of most adult Long-legged Buzzards. Claimed on at least three previous occasions in Cameroon (Holyoak & Seddon 1990, Slabbekoorn & Eilers 1999, Bobo & Languy 2000), but none documented.

Long-legged Buzzard *Buteo rufinus*

Regular Palearctic migrant to the Waza-Logone floodplains, November–April, south to Maroua. Twenty to 30 records each dry season, most in rice fields near Maga (Buij & Croes 2013), where up to five within 2-km² area in December–March (Fig. 28), catching rodents on at least four occasions. At least three dark morphs characteristic of *B. r. rufinus* observed near Maga. One photographed and individually recognisable adult returned three consecutive winters (2008–10) to an area of sorghum cultivation east of Maroua (Fig. 29), where it hunted rodents (two captures seen) and grasshoppers, often from electricity pylons (earliest and latest dates: 9 November, 2 April). Latest records: one on 20 April 2008 in Waza NP and another on 14 April 2006 just north of Maroua. Previously recorded in the inundation zone by Thiollay in 1973 (11 individuals) and 2000 (seven, three near Maga; Thiollay 2001), but only five in total in the 1990s (Sørensen *et al.* 1996, Scholte *et al.* 1999) suggest it may have been overlooked; also a frequent migrant further



Figure 28 (top). Juvenile Long-legged Buzzard *Buteo rufinus*, Maga, Cameroon, 25 December 2006 (Ralph Buij)

Buse féroce *Buteo rufinus* juvénile, Maga, Cameroun, 25 décembre 2006 (Ralph Buij)

Figure 29 (bottom). Adult Long-legged Buzzard *Buteo rufinus*, near Maroua, Cameroon, 9 January 2008 (Ralph Buij)

Buse féroce *Buteo rufinus* adulte, près de Maroua, Cameroun, 9 janvier 2008 (Ralph Buij)

north in the Lake Chad Basin (Gustafsson *et al.* 2003).

Lesser Kestrel *Falco naumanni*

Palearctic migrant. Thirty-one records, most in the inundation zone in and north of Waza NP in November–February. Southernmost: one on 11 November 2008 in a grassland with sorghum fields 4 km north-east of Maroua and three there on 21 November 2009. The contribution of *naumanni* to overall kestrel numbers appears to have declined in 2007–10: 9% *naumanni* vs. 91% *tinnunculus* ($n = 192$; Buij 2013), whereas 22.5% were *naumanni* of 80 well-identified kestrels

in 1973 (Thiollay 2001). Several in January / February 2000 (Thiollay 2001), but just three published records in and around Waza NP in the 1990s, all in November–January (Sørensen *et al.* 1996, Scholte *et al.* 1999), which might also reflect identification problems. The occurrence of at least several tens in the February / April 1973 counts compared to just 31 during five years of counts suggests that the species has declined considerably in northern Cameroon. However, larger numbers have fairly recently been reported further north, e.g. 60 on 14 April 1999 near Lake Chad in north-east Nigeria (Gustafsson *et al.* 2003).

Common Kestrel *Falco tinnunculus*

Palaearctic migrant (*F. t. tinnunculus*) and resident breeder (*F. t. rufescens*). Ten times more numerous than *F. naumanni*. Commonest in the inundation zone, where *F. t. tinnunculus* occurred at a mean abundance of 0.3 birds / 100 km in October, 4.0 in November, 5.4 in December, 7.6 in January, 7.4 in February, 6.8 in March and 1.6 in April. Thiollay (2001) recorded significantly lower kestrel numbers in January–February 2000 compared to February 1973 in northern Cameroon, but Lesser Kestrels may have comprised a large proportion of earlier counts. First recorded arrival on 11 October 2008, involving one just south of Kousseri. Palaearctic birds occurred in farmland and grassland, often catching grasshoppers and drinking at Waza's waterholes in April. The resident subspecies *rufescens* (paired adults and juveniles) was recorded year-round in mountainous terrain or near isolated rocky outcrops (38 records), most commonly in higher parts of the Mandara Mountains (rocky escarpment with short grass and bushland; >900 m above sea level), where it perched on electricity poles in small villages (Rhumsiki); others south of Maroua, near Waza NP and Poli. *F. t. rufescens* was found breeding in March–June in Nigeria (Elgood *et al.* 1973).

Fox Kestrel *Falco alopec*

Sedentary. Common in broken terrain, breeding in loose colonies in the Mandara Mountains and in isolated pairs on rocky outcrops elsewhere; also on buildings (e.g. Garoua airport). Commonest in the Sudan zone, where mean 8.4 birds / 100 km and the commonest raptor after Hooded



Figure 30 (top). Fledgling Fox Kestrel *Falco alopec* several hours after its first flight, Waza National Park, Cameroon, 10 June 2010 (Ralph Buij)

Jeune Crécerelle renard *Falco alopec* quelques heures après son premier vol, Parc National de Waza, Cameroun, 10 juin 2010 (Ralph Buij)

Figure 31 (bottom). Adult Fox Kestrel *Falco alopec* eating termites in flight, Mandara Mountains, Cameroon, 10 July 2008 (Ralph Buij)

Crécerelle renard *Falco alopec* adulte mangeant des termites en vol, Monts Mandara, Cameroun, 10 juillet 2008 (Ralph Buij)

Vulture at both seasons; less common in the Bénoué Valley south to small rocky outcrops just outside Ngaoundéré (but also recorded further south: Borrow & Demey 2001). Hunts in a variety of open habitats, including short grassland, shrubland, cultivated fields, at the edge of or in towns (e.g. Tcholliré), but not in woodland in the Bénoué Valley; never far from rocky terrain. Large groups gather in the evening near Rhumsiki to hawk insects; also in small groups hunting termite alates after rain (Fig. 31) and roosts on volcanic peaks, e.g. at least 32 in July 2009 and 43 in August 2008. In the dry season, when

some (probably mostly non-breeders) disperse to lower areas (*cf.* Thiollay 1978b), recorded in groups of up to 22 (more commonly <10) at fires, taking grasshoppers and other fleeing insects (a gathering of c.30 was observed at a small fire near Rhumsiki in February: Holmes 1972); in smaller groups near irrigated fields. Breeds in April–June, with fledglings recorded in the first half of June (Fig. 30); one pair near the entrance to Waza NP had three fledglings in 2007, 2008 and 2010, two in 2009. Adults moult remiges in June–July. Rather secretive during incubation, breeding pairs become conspicuous and vocal during the nestling phase, chasing or dive-bombing potential predators (Red-necked Buzzard, Barbary Falcon *Falco (peregrinus)pelegrinoides*, Patas Monkey *Erythrocebus patas*, Golden Jackal *Canis aureus*) near their nests (<150 m); family groups similarly noisy. Prey is caught on the ground from a perch (tree, electricity pylon, low bush), occasionally in the air or after short hover. Prey items delivered at one nest in June included grasshoppers ($n = 5$), agamid lizards ($n = 3$) and a rodent. The largest known population is in the Mandara Mountains (Thiollay 2001), where eggs or nestlings are protected by their inaccessibility; the species appears to profit from greater prey availability with human activity.

Grey Kestrel *Falco ardosiaceus*

Sedentary, with seasonal dispersal. Recorded year-round throughout the study area but numbers increase about twofold during the rains, indicative of seasonal dispersal from the south, when mean 3.4 birds / 100 km in the Bénoué Valley but still just 0.4 birds / 100 km in the inundation zone. Throughout the Sudan savanna zone, most commonly in the Mandara Mountains. Occurs in a variety of habitats, often mosaics of woodland and agriculture, more frequently in cultivated fields in the north but in riverine forest or well-wooded valleys in hilly terrain in the south. An influx of juveniles apparent each year in the inundation zone in June–July, exploiting insects (termites, beetles). A juvenile returning to the same perch caught 12 large beetles in 124 minutes on 11 June 2006. Small mammals also caught: an adult with a rodent in August north of Garoua, and a pair hunting bats (two captured) at dusk in Bénoué NP. Courtship and mating observed during the dry season (February–March) in the

Bénoué Valley where two pairs occupied old Hamerkop *Scopus umbretta* nests at the Bénoué River.

Red-necked Falcon *Falco chicquera*

Sedentary. Found throughout, provided *Borassus* or *Hyphaene* palms are present (mostly dispersing juveniles where palms are absent, such as Waza NP), most commonly in the inundation zone, where dry-season abundance 3.2 birds / 100 km, but locally more common such as along the Logone River between Tikélé and Yagoua, where 11.1, 7.0 and 9.3 birds / 100 km, respectively, in February, May and November. However, probably under-recorded during road transects: mean one pair per 1.7–2.8 km² on the partially cultivated alluvial plains of the Logone, north of Lake Maga (c.800 km²), in 2009–10. Also present year-round but rather local in the Bénoué Valley at 0.6 birds / 100 km and pairs at widespread locations in the Sudan savannas. Pairs at nests in palms in February–April in Bénoué NP and north of Lake Maga; one pair attacked a Barbary Falcon. Prey near Maga, where pairs hunt passerines near the Logone River, in rice fields, villages and along the shores of the lake: Red-billed Queleas (two) and a Northern Grey-headed Sparrow *Passer griseus*. A pair hunting White-throated Bee-eaters *Merops albicollis* on 4 November 2007 near Poli, and one with a weaver *Ploceus* sp. near Tcholliré on 29 July 2009. Two juveniles in Waza NP hunting weavers and large insects above a waterhole in July 2008.

Red-footed Falcon *Falco vespertinus* NT

Rare Palearctic migrant (main wintering range in southern Africa: Hockey *et al.* 2005). Four seen: juvenile male between Waza NP and Kousseri on 7 May 2007, adult male there next day, juvenile between Maroua and Kaélé on 18 October 2008, and adult female drinking at waterhole in Waza NP on 23 April 2010 (Fig. 32). One record in the Waza-Logone area, on 28 September 1994 (Scholte *et al.* 1999). Further south, one at Bénoué NP on 22 March 1997 (Dowsett-Lemaire & Dowsett 1999) and a specimen from Faro is dated 5 April (Reichenow 1911). Especially conspicuous on spring passage in West Africa (e.g. April 2011 in Benin and March–April 2010 in Ghana: F. Dowsett-Lemaire & R. J. Dowsett pers. obs.); large groups (several hundreds) have been reported from southern Cameroon (M. Languy



Figure 32. Adult female Red-footed Falcon *Falco vespertinus*, Waza National Park, Cameroon, 23 April 2010 (Ralph Buij)

Faucon kobez *Falco vespertinus*, femelle adulte, Parc National de Waza, Cameroun, 23 avril 2010 (Ralph Buij)

in litt. 2013) and Nigeria in April (Elgood *et al.* 1966).

Eleonora's Falcon *Falco eleonorae*

Rare Palearctic migrant. A pale morph hawking insects over mountains near Poli on 14 April 2010 (Fig. 33) is only the second field observation for Cameroon (the first being a dark morph briefly seen in the Mount Cameroon area in autumn 1996: Hivekovics & Palatitz 1998), although northern Cameroon is routinely crossed by migrating Eleonora's Falcons en route to their wintering grounds mainly in Madagascar (Gschweng *et al.* 2008, Lopez-Lopez *et al.* 2010).



Figure 33. Eleonora's Falcon *Falco eleonorae* near Poli, Cameroon, 14 April 2010 (Ralph Buij)

Faucon d'Éléonore *Falco eleonorae* près de Poli, Cameroun, 14 avril 2010 (Ralph Buij)

Sooty Falcon *Falco concolor*

Rare Palearctic migrant. One south of Rhumsiki on 1 May 2010 (10°24'N 13°33'E), hawking insects (*cf.* Buij 2011). At least five seen, mostly above rocky outcrops, near the entrance to Waza NP (11°24'N 14°33'E) between 7 and 28 July 2010. The first published records for Cameroon, and among the few for the region.

Eurasian Hobby *Falco subbuteo*

Uncommon Palearctic migrant. Twelve observed, in Waza NP—on 20 October 2007 (juvenile), 10 November 2007 (two adults and a juvenile) and 10 October 2008 (one)—near Rhumsiki and in and around Bouba Ndjida NP—seven between 1 and 18 April 2010, among them at least three juveniles. On three occasions Eurasian Hobbies were seen hawking dragonflies and other large insects. The only other records for northern Cameroon are an adult in February 1973 in Waza NP (Thiollay 1978a) and one in Bénoué NP on 18 March 1999 (Dowsett-Lemaire & Dowsett 1999). The migration routes of satellite-tracked adult Eurasian Hobbies from Sweden converged near the equator south of Cameroon (Strandberg *et al.* 2009), most crossing southern Cameroon; the majority of field observations are from the forest zone in March–April, including large groups (100+ birds; M. Languy in litt. 2013).

African Hobby *Falco cuvierii*

Sedentary, with seasonal dispersal northward with the rains. Regularly recorded in the Far North Region during the rains and in the Bénoué Valley (where it breeds) during the dry season (all records there March–May); total of 61 records. In the north mainly in and around Waza NP (41 records), on 1 June–24 October, most in July–August. Often in loosely associated groups of 2–4, but at least 11 hawking dragonflies and other insects over rocky outcrops and surrounding plains in Waza NP on 26 July 2010. Also in the Mandara Mountains on 10–11 July 2008 at alate termite swarms (with Fox Kestrels, Hooded Vultures and Wahlberg's Eagles), three near Maroua on 10 October 2008, and one near Moutourwa on 31 August 2009. Almost all those north of the Bénoué Valley were juveniles or second-years (Figs. 34–35), but two adults tentatively identified in July 2007; most adults probably remain in the breeding areas, merely becoming more discreet during the non-



Left, top to bottom

Figure 34. Second-year African Hobby *Falco cuvierii* (note remiges of different generations and moulted central rectrices) hawking insects, Waza National Park, Cameroon, 27 August 2006 (Ralph Buij)

Faucon de Cuvier *Falco cuvierii* de deuxième année (noter les rémiges de différentes générations et les rectrices centrales muées) chassant des insectes, Parc National de Waza, Cameroun, 27 août 2006 (Ralph Buij)

Figure 35. Second-year African Hobby *Falco cuvierii* hawking insects, Waza National Park, Cameroon, 28 July 2007 (Ralph Buij)

Faucon de Cuvier *Falco cuvierii* de deuxième année chassant des insectes, Parc National de Waza, Cameroun, 28 juillet 2007 (Ralph Buij)



Figure 36. Fledgling African Hobby *Falco cuvierii* at nest near river, Bouba Ndjida National Park, Cameroon, 2 May 2008 (Ralph Buij)

Jeune Faucon de Cuvier *Falco cuvierii* au nid près d'une rivière, Parc National de Bouba Ndjida, Cameroun, 2 mai 2008 (Ralph Buij)



breeding season. Two recent fledglings returning to a nest (Fig. 36), where still fed by both adults (once an unidentified bird), on 2 May 2008, in Bouba Ndjida NP, suggest egg laying in late February / early March in the Bénoué Valley.

Moulting (body and flight feathers) juveniles and second-years in July.

Lanner Falcon *Falco biarmicus*

Partial migrant. Evidence of northward movement into the Sahel with the start of the rains in May–June, and south in November, as reported from Nigeria westwards (Elgood *et al.* 1973, Thiollay 1977). Most common in the inundation zone, where 4.3 and 4.6 birds / 100 km during the dry and wet seasons, respectively. Peak numbers there in June and November (mostly juveniles; mean abundance both months: 7.3 birds / 100 km), and in August in the grasslands south of Kousseri (10.5 birds / 100 km), where none was seen in September–October, when migrants move north with the rains (Elgood *et al.* 1973). Mostly juveniles and subadults, which dominate migratory groups, seen foraging together (2–6 birds) in the inundation zone, May–August, for alate termites and larger insects (locusts, grasshoppers, dragonflies) often over rocky outcrops or open woodland. Larger numbers gather at fires in October–December, coinciding with southbound migration. *F. biarmicus* is more strongly associated with dry woodland than seasonally flooded grassland or cropland during the dry season (Buij & Croes 2013); few occur in rice fields. Up to three together at Waza NP's

waterholes during the late dry season (March–April), where flocks of birds (weavers, doves, etc.) were hunted (one adult caught a Red-billed Quelea during ten attempted strikes on birds over period of 70 minutes, in April). Less common but still widespread in the Bénoué Valley, where mostly seen near cultivation and settlements, and none seen in August–September. Rather common in the Mandara Mountains, where several nests on cliffs and rocky outcrops, and numbers peak in November–May at 6.6 birds / 100 km, with just 0.4 birds / 100 km in August–September. Adults and juveniles were seen taking young domestic chickens three times (out of nine attempts observed), around Waza NP, near Maroua and north of Banda, and an adult hunted domestic / feral pigeons south of Garoua on 3 November 2007. One pair bred in an old Pied Crow nest on an electricity pylon near Maroua in February–May in 2007–09 (two fledglings in 2007, three in 2008, none in 2009).

Saker Falcon *Falco cherrug* EN

Rare Palearctic migrant. An adult on a pylon 12 km north-west of Maroua on 15 October 2006, and another in flight near Bodelaram waterhole, Waza NP, on 29 and 31 December 2006 (Fig. 37), harassed by an adult male Montagu's Harrier. The Far North Region is at the southern limit of the range of this rare migrant: three were in the Waza-Logone area in February–April 1973 (Thiollay 1978a), one in 1971 (Vielliard 1972) and three were south-west of Waza in January / February 2000 (Thiollay 2001), with one near Lake Chad in south-east Niger on 13 November 2009 (NiBiDatabase 2013).

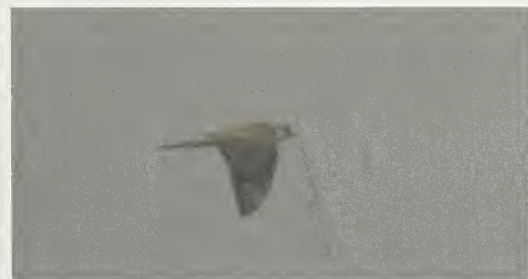


Figure 37. Saker Falcon *Falco cherrug*, Waza National Park, Cameroon, 29 December 2006 (Ralph Buij)

Faucon sacré *Falco cherrug*, Parc National de Waza, Cameroun, 29 décembre 2006 (Ralph Buij)



Figure 38. Peregrine Falcon *Falco peregrinus peregrinus* / *calidus*, Waza-Logone floodplain, Cameroon, 29 November 2008 (Ralph Buij)

Faucon pèlerin *Falco peregrinus peregrinus* / *calidus*, plaine inondable de Waza-Logone, Cameroun, 29 novembre 2008 (Ralph Buij)

Peregrine Falcon *Falco peregrinus*

The Palearctic races *calidus* / *peregrinus* were identified on 29 November 2008 (Fig. 38), 1 March 2009, 1 and 8 March 2010 in the inundation zone, and near Maroua in February 2008. Twice with bird prey (once a *Streptopelia* sp.). The local race *minor* is rare in northern Cameroon: singles on 6 March 2010, in the inundation zone, and on 1 June 2009, in cultivated fields 40 km south-west of Waza NP. None in the Mandara Mountains, where sedentary pairs reported to breed (Thiollay 1978a). One identified in Bénoué NP on 4 April 1999 (N. Borrow *in litt.* to Dowsett-Lemaire & Dowsett 1999).

Barbary Falcon *Falco (peregrinus) pelegrinoides*

More common than the few published records suggest. Generally regarded as a Palearctic migrant or vagrant (Borrow & Demey 2001), possibly from north-east Africa. Observed in the inundation zone in October–January and May–July, between 9 December 2006 and 26 July 2010. First record: adult male and female, Waza NP, 20 May 2010. Latest record: adult and juvenile, Waza NP, 17 January 2008. Most often single adults (17 records; Fig. 39), but at least two different pairs seen January, May–July and October, whereas most juveniles ($n = 7$) were seen in July (Fig. 40). Adults and juveniles seen together on 29–30 July 2007, 17 January 2008 and 1 July 2010, near Waza NP, but the behaviour of the juveniles suggested they were independent. An adult was



39



40



41



42

Figure 39. Adult Barbary Falcon *Falco (peregrinus) pelegrinoides*, Waza National Park, Cameroon, 17 June 2007 (Ralph Buij)

Faucon de Barbarie *Falco (peregrinus) pelegrinoides* adulte, Parc National de Waza, Cameroun, 17 juin 2007 (Ralph Buij)

Figure 40. Juvenile Barbary Falcon *Falco (peregrinus) pelegrinoides* over Waza Rock, Cameroon, 30 July 2007 (Ralph Buij)

Faucon de Barbarie *Falco (peregrinus) pelegrinoides* juvénile au-dessus du rocher de Waza, Cameroun, 30 juillet 2007 (Ralph Buij)

Figure 41. Barbary Falcon *Falco (peregrinus) pelegrinoides* with Chestnut-backed Sparrow Lark *Eremopterix leucotis* prey, Waza Rock, Cameroon, 16 December 2006 (Ralph Buij)

Faucon de Barbarie *Falco (peregrinus) pelegrinoides* avec une Moinelette à oreillons blancs *Eremopterix leucotis* comme proie, rocher de Waza, Cameroun, 16 décembre 2006 (Ralph Buij)

Figure 42. Male Barbary Falcon *Falco (peregrinus) pelegrinoides* (the female was perched 20 m lower), Maga, Cameroon, 25 October 2010 (Ralph Buij)

Faucon de Barbarie *Falco (peregrinus) pelegrinoides* mâle (la femelle était perchée 20 m plus bas), Maga, Cameroun, 25 octobre 2010 (Ralph Buij)

seen hunting domestic pigeons (two unsuccessful attempts over two days) from the mobile phone tower in Waza village in July 2010; the male of this pair also made an unsuccessful effort to catch a Bruce's Green Pigeon *Treron waalia* in level flight on 20 May 2010. One took a Chestnut-backed Sparrow Lark *Eremopterix leucotis* in December 2006 (Fig. 41). Away from Waza NP, observed south of Kousseri on 24 November 2007 (stooping at domestic / feral pigeons in a village)

and 5 January 2009, two over Maga rice fields on 27 January 2010, an adult north of Lake Maga on 8 December 2007 and a pair perched together on the mobile phone tower in Maga village on 24 October 2010 (Fig. 42). Previous records included one in Waza NP on 20 December 1990 (Robertson 1992), one in Kalamaloué NP on 21 January 1993 (Scholte *et al.* 1999) and an adult south of Waza on 17 November 1993 (Sørensen *et al.* 1996). Two adults in November 2001 near

Lake Chad in extreme north-east Nigeria (Velmalä & Gustafsson 2003), c.190 km north-west of Kousseri and an adult flew over N'Djamena, Chad, in August 2010. Observations of paired adults with fresh juveniles and almost year-round records in dry and wet seasons might imply nearby breeding. However, pair-bonding may persist in non-breeding areas; furthermore, the lack of records of adults in the Waza-Logone area during a four-month period between 17 (or 21) January and 20 May, coinciding with the breeding period and spring migration peak further north, is more indicative of regular post-breeding dispersal to the Lake Chad Basin than of breeding (*cf.* Hogg 1983, Brouwer & Mullié 2000).

Discussion

With these observations, the list of raptors observed in northern Cameroon totals 60 species, five of which had not previously been documented in the region (African Cuckoo Hawk, Levant Sparrowhawk, Red-thighed Sparrowhawk, Common Buzzard, Eleonora's Falcon). Our observations reiterate the importance of the Lake Chad Basin as a wintering area for Palearctic raptors (Thiollay 1978a), and we recorded 25 species of (partially) Palearctic origin. Steppe Eagle, Eastern Imperial Eagle, Long-legged Buzzard and Barbary Falcon proved more common and regular than previously reported ('vagrants' to northern Cameroon: Borrow & Demey 2001), whereas the two spotted eagles appear to be irregular visitors to the southern inundation zone of the Lake Chad Basin. Western Marsh Harrier and, perhaps surprisingly, Booted Eagle are the most common migrants to the region. Brown (1970), who lived in neighbouring Nigeria for four years, stated that 'in Africa south of the Sahara the Booted Eagle is seldom noticed', while Thiollay (1978, 2001) saw only a handful in the inundation zone in the 1970s, but recorded three times as many Booted Eagles in 2000. Perhaps locally improved foraging conditions (expansion of rice; Buij & Croes 2013), or the increase of Booted Eagle populations in south-western Europe (they winter in Nigeria; *cf.* Chevallier *et al.* 2010) during recent decades (Mebs & Schmidt 2006), have contributed to the greater numbers wintering in the region. Palearctic falcons use the inundation zone during almost all months; while some only visit this region to refuel during short stopovers (Eurasian Hobby, Red-

footed Falcon, Sooty Falcon), others depend on its food resources (mainly grasshoppers and birds) over 4–8 months of their non-breeding period (Common and Lesser Kestrels, Peregrine, Barbary and Saker Falcons). Most other Palearctic migrants remain in the inundation zone in September–April (especially October–March), while others only pass through to wintering grounds further south or east (European Honey Buzzard, Common Buzzard: Thiollay 1989), and Ospreys visit in relatively small numbers compared to coastal areas (Zwarts *et al.* 2009).

The intracontinental shift in timing of the rains has important consequences for the spatial distribution of food resources for migrants (Newton 1998) and thus their occurrence in northern Cameroon. In East and southern Africa, the arrival of Palearctic migrants coincides with the rains when the Intertropical Convergence Zone (ITCZ) moves south, and large- and small-bodied raptors are often seen feeding in large mixed groups on emerging termites and other wet-season-related prey outbreaks while tracking the rain fronts (Brown *et al.* 1982, Steyn 1982). In western Africa's Sudano-Sahelian savannas, however, the flush of prey associated with the northward movement of the ITCZ occurs in the boreal spring and summer (e.g. Njiforti 1997), i.e. when most Palearctic migrants are absent. Whereas many insects and breeding Red-billed Queleas are still abundant on the arrival of Palearctic migrants in September (Thiollay 1989), their abundance rapidly declines thereafter, while grasshopper abundance is highest in drier vegetation (Zwarts *et al.* 2009, Trierweiler *et al.* 2013). Consequently, those insectivorous migrants that do winter for a prolonged period in western Africa's savanna zone feed mostly on grasshoppers and, if outbreaks occur, locusts: Common and Lesser Kestrels, Black Kite and Montagu's Harrier (Zwarts *et al.* 2009, Buij *et al.* 2012). These migrants track shifting seasonal changes in grasshopper availability with decreasing green vegetation and cover southwards (Thiollay 1989, Trierweiler *et al.* 2013), most arriving in northern Cameroon's inundation zone in January. Their numbers appear to be smaller in East and southern Africa (Brown 1970, Harrison *et al.* 1997, Hockey *et al.* 2005), with the exception of Lesser Kestrel. Conversely, most Eurasian Hobbies, Eleonora's, Sooty and Red-footed Falcons migrate with the

ITCZ to their main winter ranges in southern Africa and Madagascar, gathering in numbers only where aerial insects abound after heavy rains. Recent satellite-telemetry data indicate that these insectivorous falcons regularly pass over western Africa including Cameroon (Gschweng *et al.* 2008, Strandberg *et al.* 2009, Lopez-Lopez *et al.* 2010), but probably often at such high altitudes that they go largely undetected (*cf.* Brown 1970). They are most conspicuous in western Africa on their return journey, between April and July, when they descend to lower altitudes to forage after the first seasonal rains trigger insect flushes, although Eleonora's Falcons also make substantial stopovers in autumn (Gschweng *et al.* 2008).

Apart from their predominantly easterly entry into Africa (Newton 1998), the rarity of the four Palearctic *Clanga* and *Aquila* eagles west of Cameroon may also be partially explained by the prevailing dry conditions and relative scarcity of prey during much of the winter period. Lesser Spotted Eagles, particularly, exploit high-density flushes of easily caught, rain-related prey (alate termites, locusts, frogs, Red-billed Quelea nestlings), south to southern Africa (Steyn 1982, Meyburg *et al.* 2001). To some degree, the winter distribution of Steppe Eagles may also be governed by flushes of productivity generated by rains in East and southern Africa (Brown *et al.* 1982, Steyn 1982), and large numbers of Steppe and Lesser Spotted Eagles often appear when termites emerge after rains. However, many Steppe Eagles winter in dry conditions north of the equator, where vertebrates (rodents, carrion, queleas) are the dominant food (Smeenk 1974, Clouet *et al.* 2000, Meyburg *et al.* 2003). The same is true for most Eastern Imperial and Greater Spotted Eagles (Naoraji 2006, Al Hasani *et al.* 2012), although the latter possibly consume many locusts when outbreaks occur (Brown 1970) and also migrate south of the equator (Meyburg *et al.* 1998). We did not witness any insect-hunting by *Clanga* and *Aquila* eagles in northern Cameroon, where these birds often forage alone and vertebrates (also obtained as carrion or by pirating food) appear to be the dominant food source, as in other dry areas of the winter range. Because of the low food abundance in the Sahel in the second half of the winter period, productive wetlands and especially large-scale rice cultivation with abundant diurnal rodents are particularly attractive to Steppe

Eagles, in addition to Booted Eagles, Long-legged Buzzards, Western Marsh and Pallid Harriers (Thiollay 1989, Buij & Croes 2013).

During the transition period from the dry to the wet season, after the departure of most Palearctic migrants, the inundation zone acts as an important dispersal area for many Afrotropical raptors. These include intra-African migrants whose entire populations, or at least a significant proportion thereof, migrate north with the rains, which become shorter and start progressively later with increasing latitude. The timing of migrations differs between species: African Swallow-tailed Kite, Shikra, Grasshopper Buzzard and many Black Kites are already present in the inundation zone before the rains, while most Wahlberg's Eagles, Beaudouin's Snake Eagles and Red-necked Buzzards arrive after the first rains. Of these migrants, most move further north with the rains, which largely confirms the descriptions of raptor movements in neighbouring Nigeria (Elgood *et al.* 1973) and Chad (Salvan 1967–68), and in greater detail in Côte d'Ivoire, Niger, Burkina Faso and Mali (Thiollay 1977, 1978b). Seasonal movements are correlated with food availability, especially activity, abundance and accessibility of terrestrial prey species, which are strongly influenced by the rains, and their effect on grass cover and inundation (Thiollay 1978b). After the rains (from October), migrants gradually return to lower latitudes, where abundant food resources become available with fires, grass cutting and grazing. Few African migrants linger in the inundation zone during the first half of the dry season (Grasshopper Buzzard, non-breeding Red-necked Buzzard), or throughout it (non-breeding Beaudouin's Snake Eagle, Wahlberg's Eagle, Shikra), but most Black Kites and African Swallow-tailed Kites remain there throughout the dry season.

In addition to intra-African migrants, other raptors in northern Cameroon display nomadic or partial movements, involving at least part of the adult population, namely Secretary-bird, Black-winged Kite, White-backed Vulture, Rüppell's Vulture, Lappet-faced Vulture, Tawny Eagle and Lanner Falcon, confirming previous findings further west (Elgood *et al.* 1973, Thiollay 1978b). Ayres's Eagle also appears to be a partial migrant that moves into northern Cameroon during the rains (May–September), as in Central

and southern Africa, where this species also occurs in more open woodland and similarly enters densely populated areas during the non-breeding (wet) season (September–April: Steyn 1982). Large vultures wander widely (Mundy *et al.* 1992), with changes in ungulate mortality rates due to seasonal variations in rainfall perhaps triggering such movements (Kendall *et al.* 2012). This would explain the dry-season increase in numbers of Rüppell's and Lappet-faced Vultures in the inundation zone. Interestingly, Rüppell's and White-backed Vultures were recorded in larger numbers during the rains at the Bénoué Valley and Adamawa Plateau, and further studies are needed to determine the factors underlying such movements. Black-winged Kite numbers fluctuated greatly in the inundation zone, but this species appears to be resident in the Sudan zone and Bénoué Valley, probably because rodents reliably occur in cultivated areas. However, long-distance seasonal movements cannot be excluded even when local numbers are relatively stable (Steyn 1982). The Lanner Falcon influx with the rains into the inundation zone mainly comprised immatures, which were attracted to abundant insects and also invade drier areas mainly during the rains in southern (Steyn 1982, Van Zyl *et al.* 1994, Herremans & Herremans-Tonnoeyer 1996) and East Africa (Tsavo NP: Smeenk 1974), attracted by locusts, Red-billed Queleas and swarming termites. Similarly, aggregations of non-adult Tawny Eagles occur during the rains in the Kalahari (Steyn 1982) and are probably drawn from a very wide area. Although little evidence was found for partial migration or nomadic movements by African Harrier Hawk, Bateleur, Western Banded Snake Eagle, Gabar Goshawk, African Fish Eagle, Fox and Common Kestrels (local race *rufescens*), as reported further west (Thiollay 1978b), juveniles or subadults of various sedentary species also routinely dispersed to the inundation zone during the rains: Brown Snake Eagle, African Hawk Eagle, Martial Eagle, Grey Kestrel and African Hobby. This phenomenon was also reported by Thiollay (1978b) for African Harrier Hawk, Bateleur and African Hobby in Burkina Faso, Mali and Niger, and suggests that the ephemeral food increase on the Lake Chad plains is important for the survival of dispersing young raptors.

Like seasonal displacements, the timing of breeding differs between Afrotropical raptors according to their morphological characters, corresponding accessibility of their principal prey items (Thiollay & Clobert 1990) and generally coincides with the seasonal peak thereof: many species nest during the transition period from the dry to wet season (April–July; African Swallow-tailed Kite, Lappet-faced Vulture, Gabar Goshawk, Ovambo Sparrowhawk, Grasshopper Buzzard, Black Kite, Fox Kestrel) or the main wet season (African Cuckoo Hawk, Long-crested and Wahlberg's Eagles, Shikra). African Swallow-tailed Kite and Grasshopper Buzzard feed nestlings on a diet dominated by small terrestrial prey (Buij *et al.* 2013a,d), which is accessible and abundant at the start of the rains at this latitude, while fledglings capture nutrient-rich termites or other insects in July, and subsequently move north with the shifting ITCZ (Thiollay 1978b). The start of breeding in migrants is later with a delay in the rains, e.g. Grasshopper Buzzard breeds later at higher latitudes (Buij *et al.* 2013e), reflecting the northward movement of the ITCZ and a later peak in food abundance. Beaudouin's Snake Eagle and Red-necked Buzzard breed in more southerly woodlands during the dry season, but the protracted breeding period of Shikras encompasses dry and wet seasons at different latitudes. Finally, Wahlberg's Eagle is exceptional because it is the only migrant that breeds during the rains in the inundation zone, when non-breeding visitors from southern Africa are also present (Meyburg *et al.* 1995). In addition to the nest records reported here, and others in western Africa, Wahlberg's Eagles lay eggs at the height of the wet season north of the equator (one pair at 2,500 m in Addis Ababa: Vittery 1978), but 2–3 months before the peak rains in southern Africa (Zimbabwe: Steyn 1982; Botswana: Penry 1994; Malaŵi: Dowsett-Lemaire & Dowsett 2006; Zambia: Dowsett *et al.* 2008) and East Africa (Kenya: Brown 1970, Smeenk 1974). In areas north and south of the equator, nestlings apparently fledge when grass cover and prey abundance (birds, rodents, lizards) is high or even maximal after the peak in seasonal rainfall (*cf.* Thiollay 1978b).

Raptor declines

The over-riding factor currently affecting raptors in northern Cameroon is the strong human

population increase, which has greatly changed landscape functioning and its capacity to support wildlife. The densely populated Sudan zone, normally the richest latitude for raptors in the region (Thiollay 1977), has an impoverished raptor community, with the exception of some species (human-commensal Hooded Vulture, Fox Kestrel) that are commonest here (Buij *et al.* 2013b). The diversity and species richness of Afrotropical raptors is highest in the Bénoué Valley, where local deforestation around the national parks has improved prey accessibility for open-country raptors (Buij *et al.* 2013b,c), including large eagles. However, the negative association of human populations with species richness illustrates that population growth is impacting resident species irrespective of advantageous changes in habitat structure (Buij *et al.* 2013c). The ecological changes following embankment of part of the Waza-Logone floodplain for rice cultivation, notably the desiccation of large parts of the formerly rich flooded grasslands and increased permanent settlement, has negatively impacted Afrotropical raptors (Thiollay 2001, Buij & Croes 2013) and insectivorous Palearctic raptors (Buij *et al.* 2012, 2013c). In general, few species appear to have benefited from the expansion of food crops, with the exception of rodent specialists such as Black-winged Kite and vertebrate-hunting Palearctic migrants such as Booted Eagle and Western Marsh Harrier (Buij *et al.* 2013c, Buij & Croes 2013). The degraded woodlands around Waza NP still provide adequate habitat for nesting migrants adapted to exploit unpredictable, seasonal and easily accessible prey, such as African Swallow-tailed Kite and Grasshopper Buzzard (Buij *et al.* 2013a,e), but nestling condition and survival may be affected by land-use change (Buij *et al.* 2013d). Contrary to migrants, sedentary generalists depend on stable prey resources within fairly small ranges, and may have suffered from a reduction of prey quality (Buij 2013). Moreover, people target raptor nests for food in the inundation zone and further south (Mandara Mountains), e.g. during the early rains when seasonal workers supplement their diet with nestlings, squirrels, hedgehogs, monitor lizards, francolins and other bushmeat (Njiforti 1997). Many keep poultry and some feral pigeons for trade, but these are regularly captured by Lanner Falcons and other raptors,

and retaliatory persecution increases pressure on all nesting raptors.

Although all large raptors were also seen outside park boundaries, their richness decreases with distance to national parks (Buij *et al.* 2013c), while some (Lappet-faced Vulture, Bateleur, African Fish Eagle) appear more dependent on parks than others. A few eagles (Long-crested, Tawny and African Hawk Eagles) breed in small numbers where woodlands harbour small vertebrates (e.g. gamebirds, hyrax, squirrels) or even among cultivated fields (Wahlberg's Eagle). Others, e.g. Martial Eagle, breed in national parks, but range widely outside to hunt over cultivation, where mortality rates might be high due to persecution. Additionally, poaching reaches dramatic levels in the Far North Region, especially in Waza NP (Tumenta *et al.* 2010) and increasingly in the Bénoué Valley, where local poachers with self-made firearms and commercial (elephant) poachers from Sudan and Chad constitute a threat to small to medium-sized vertebrates and ungulate populations. The harvest of Red-billed Queleas and other passerines for consumption is widespread, in towns and villages, with slingshots (children) and guns, but frequently pesticides. Pesticides are cheaply and widely available in local markets, while their heavy use in cotton probably underlies negative associations of cotton cultivation with raptor richness and abundance in the Sudan zone (Buij *et al.* 2013c). Carbofuran and other carbamate or organophosphate insecticides (monocrotophos, profenofos, trimethacarb) and rodenticides (zinc phosphide) are used to poison wildlife for consumption (Buij & Mohamadou unpubl. data), using baits (rice, meat), but often at waterholes during the late dry season by digging small depressions close to larger waterholes; drinking mammals and birds including raptors instantly succumb. Around Waza NP, this practice has been fought by local populations after domestic animals were killed, but it remains a frequent and widespread practice. This is likely to constitute a major threat, increasingly also in the Bénoué Valley, for raptors gathering at waterholes and along seasonal rivers during the dry season: Secretary-bird, large vultures, Tawny Eagle, African Fish Eagle, Long-crested Eagle, Bateleur, African Harrier Hawk, Gabar Goshawk, Dark Chanting Goshawk, Grasshopper Buzzard, Lanner Falcon, and Palearctic Steppe Eagle,

harriers and kestrels are all at risk. Pesticides are also used for fishing in the Bénoué Valley and thus contaminate waterbodies, while declining fish stocks in the Logone River, Lake Chad and dry-season waterholes inside Waza NP are intensively utilised (Scholte 2003), further weakening the prey base for African Fish Eagles and Ospreys.

Vulture decline

The disappearance of breeding colonies and comparative counts by Thiollay (2001) indicate that vultures have been relatively hardest hit, for various reasons that deviate somewhat from other raptors. First, and probably foremost, deliberate targeting of vultures to supply the traditional medicine market has become an important cause of vulture mortality in northern Cameroon since the start of the 21st century. Vulture carcasses sold on markets throughout the region are proof of large-scale persecution (Nikolaus 2001, Igoli *et al.* 2005, Soewu 2008), mainly to supply the large Nigerian traditional medicine trade. Vultures are killed by poisoning of waterholes or using other techniques, e.g. poisoned baits, shotguns and traps (Saidu & Buij 2013). All parts of vultures are used, even eggs, faeces and nests, but heads of *Gyps* and Lappet-faced Vultures are especially valued for their purported medicinal properties (Nikolaus 2011). According to local reports (Buij & Mohamadou unpubl. data), poaching of large vultures soared in the late 1990s and early 2000s; eyewitness accounts suggest dozens of vultures were killed near waterholes in and around Waza NP in the early 2000s. Hooded Vulture is now the commonest vulture sold in northern Cameroon and Nigeria (Nikolaus 2011, Ogada & Buij 2011). Lappet-faced and White-backed Vultures are probably more vulnerable to nest harvesting or disturbance by humans than Rüppell's Vulture, with most remaining nest sites being on steep, inaccessible cliffs. The disappearance of easily accessible nest sites of Rüppell's Vulture in trees and on low rocky outcrops in Waza NP in the late 1990s may be informative in this respect, as it coincided with a general increase in ungulate numbers in the area and an abundance of livestock carcasses (e.g. >1,500 cattle died during an epidemic of foot-and-mouth disease near Maga in 1997: Scholte 2005).

Apart from their use in traditional medicine, other reasons for the vulture decline may include

poaching and nest disturbance in national parks, better sanitation in human settlements, more rapid disposal of carcasses, and disease. Locals in the Waza-Logone area claim that vultures are killed because they reveal the whereabouts of poached animals, particularly elephants, to wildlife officials. Nest disturbance of White-backed and Lappet-faced Vultures in Waza NP has probably increased with more frequent incursions by poachers and shepherds (Tumenta *et al.* 2010), the latter having admitted to using vulture nests to protect their livestock against stinging flies (smoke from nests set alight). With increasing numbers of sedentary farmers in the Waza-Logone area, the collection of livestock carcasses for consumption has increased during the dry season, and is common practice by villagers and game guards in the Bénoué Valley (pers. obs.; *cf.* Scholte *et al.* 2009). Although this might reduce food supplies, at present many carcasses especially in the inundation zone are left untouched, so lack of food is unlikely to cause further declines. Another potential source of concern is avian influenza virus H5N1, with reports of 45 dead or dying Hooded Vultures in February–June 2006 in Ouagadougou (Ducatez *et al.* 2007), where steep declines were noted after 2005 (P. Weesie *in litt.* 2011). The unknown cause of massive Hooded Vulture deaths in Maroua in the 1990s, where poisoning seemed unlikely (Scholte 1998), might also have been caused by disease.

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